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AVIATION

The Oldest American Aeronautical Magazine

JUNE 18, 1928 | Issued Weekly | PRICE 20 CENTS

Twelve planes of the Selfridge Field Pursuit Group turning in formation.

VOLUME XXIV

NUMBER 25

Special Features

The Wallace Touroplane
Engine Exhaust Silencers
Aircraft Radio Beacon Development

AVIATION PUBLISHING CORPORATION
250 WEST 57 STREET, NEW YORK

Publication Office, Highland, N. Y. Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office, at Highland, N. Y. under Act of March 3, 1879.

SIGHTSEEING

"JOY-HOPPING" has certainly recovered from the late and unlamented gypsy days of Jennies and haywire. But people are going at it with a different interest. Now it is to see what old Mother Earth looks like from above, rather than to obtain the thrills of flying, which they have learned exist mostly in conversation.

The sightseeing business is booming. And it is a profitable business, not only for immediate financial return but also because it acquaints people with your field, your men, your facilities and your ships. Then, when you start up a transport line, you have a large number of ready-made customers.

The Ford tri-motored, all-metal monoplane is just about as near an ideal ship for sightseeing as you could wish. Enclosed cabin that you can get into as easily as into a street car. Plenty of windows that can be opened. Passengers shielded from the glare by the wing. Comparatively little engine noise. Comfortable seats. Quick take-off. Controllability on landing and taxi-ing, due to independent brakes. And no forced landings. So much for the passenger's safety, comfort and happiness.

From a money-making standpoint, it allows you to put fourteen passengers in the air at one time with your pilot instead of but two or three. Your plane needs no ground crew —it takes care of itself. Loading and unloading is quick. And by taking so many at a time the crowd awaiting its turn never gets so large that newcomers become discouraged.

Moreover—when you do start your transport line from one terminal point to another, the same Ford ship can be placed in that service immediately!

For complete information on Ford ships and their performance in sightseeing, transport, freight or other service, write to

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Division of
FORD MOTOR COMPANY
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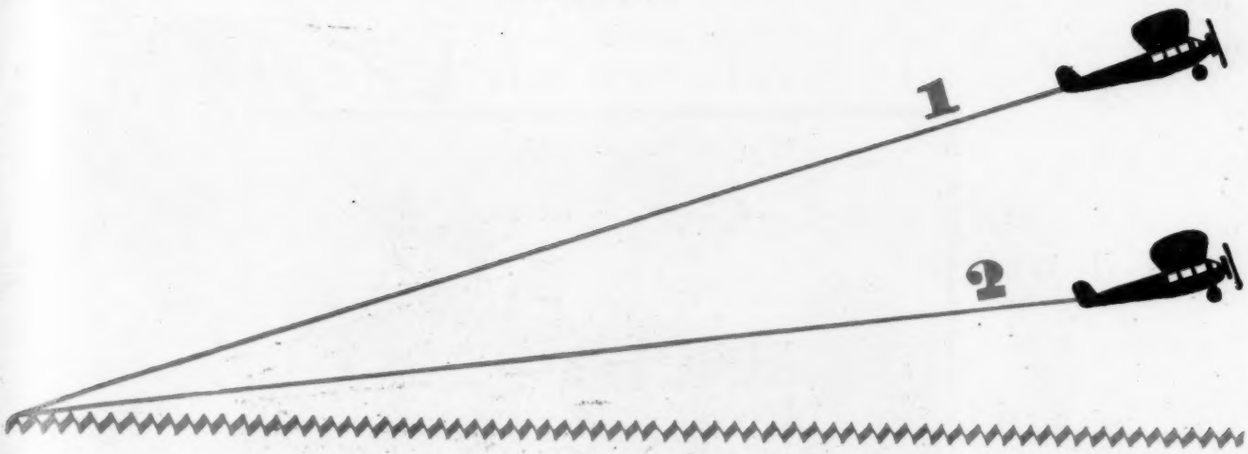


CAMINEZ ...CLIMB

Airplane (1) is powered by a Fairchild Caminez Engine, taking off at the same time as 'plane (2), which is powered by a conventional type of engine of the same horsepower. In one minute after the take-off, the Caminez-powered 'plane (1) will have climbed 40% higher (at 125% greater angle of climb) than 'plane (2). Why?

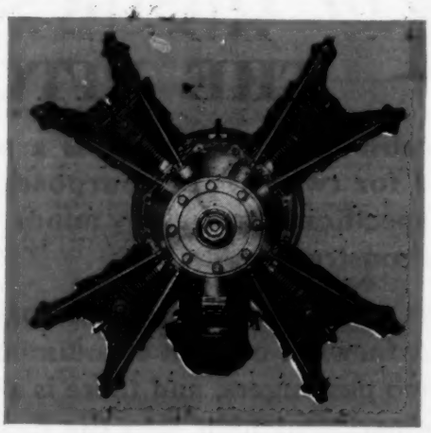
A CAMINEZ-POWERED 'plane will climb 40% higher, in a given time, with so much less forward speed that the angle of climb will be 125% greater than that of a 'plane powered by the usual type of engine of the same horsepower. For this reason, a Caminez-powered 'plane will start to climb after less "ground-run"... and can consequently get out of fields where a 'plane powered by the conventional type of engine could never take-off.

The unusual ability of the Caminez Engine to climb is the result of the high efficiency obtained by the half-speed propeller. This half-speed propeller efficiency is made possible by the use of the patented cam drive and without the disadvantages of reduction gears.

Heretofore, low weight per horse power has been developed in aviation engines by increased propeller speed through greater engine r.p.m. But, experience has proven that a high-speed propeller does not give high maximum efficiency — particularly during climb and take-off, when high thrust power is so essential.

Consequently, to obtain maximum thrust and at the same time overcome the lack in efficiency of the high-speed propeller for commercial air-craft—it is necessary either to use propeller reduction gears with the ordinary type of motor, or to use the Fairchild Caminez Engine.

"Climb" is but one of the outstanding features of the Fairchild Caminez. The complete story of this remarkable engine is too big for a single advertisement. Write for the Caminez Engine Book. The Fairchild Caminez Engine Corporation, Farmingdale, Long Island, New York.



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For Business and Pleasure *flying*

THE PITCAIRN MAILWING

The Pitcairn PA-5 Mailwing* is a plane designed for two distinct purposes and adapted specifically to each by minor variations in construction details.

The Sport model is designed for the private owner. A forward cockpit accommodates one or two passengers, and there is a baggage compartment built into the fuselage behind the pilot's seat, making the ship ideal for touring.

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The Pitcairn Mailwing* in either model is a plane of wide speed range, remarkable stability and highest maneuverability. It is now employed by six Contract Air Mail operators and many private owners.

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*Reg. U. S. Pat. Off.

PITCAIRN AIRCRAFT INC.

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Adjustable clutch-type bridge (Patented) maintains horizontal alignment under all conditions. Accurately adjustable to the spread of your eyes and especially adapted to prescription lenses.

Double-lip asymmetrical sponge rubber cushions (Patented) provide complete comfort and perfect fit to the contour of your face....no air seepage possible. Will not roll in the strongest air stream....the metal frames can not touch your face. You will never know you've got them on.

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Meyrowitz Luxor Goggles are for sale at airports, flying schools, by aircraft dealers, leading opticians and sporting goods stores. If you are unable to obtain what you want, write directly to us.

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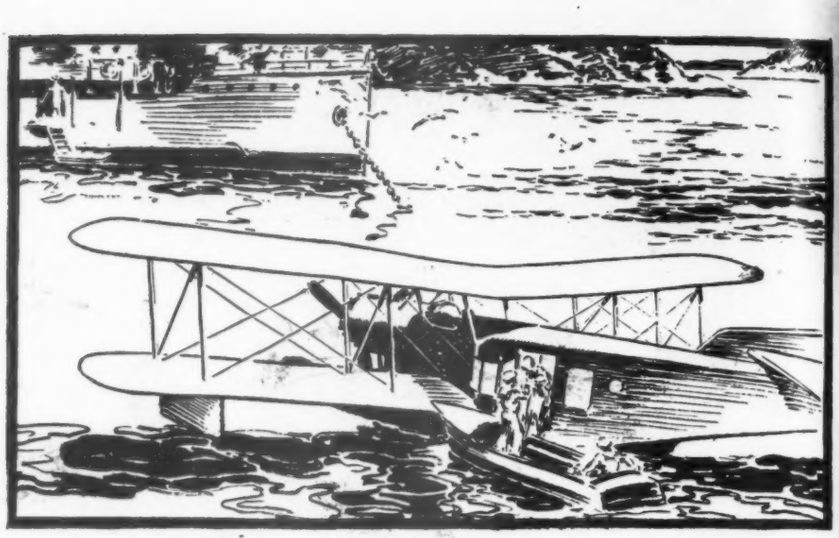

for every Commercial Purpose~ over Land and Sea

The air is the great highway accessible to all places, but the airplane can only be considered to have really attained its dominating career when it is endowed with ability to land and operate from both land and water. "For every commercial purpose—over land and sea," identifies the Loening Cabin Amphibian and its use makes possible the inauguration of a more practical era of flying. An attractive, illustrated booklet, containing complete information, will be mailed to you upon request.

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Powered with 410 h.p. Pratt & Whitney "Wasp" Engine

LOENING AERONAUTICAL ENGINEERING CORPORATION
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Phillips "77" is the fuel selected and used by Boeing between Chicago and Salt Lake City for this important, dependable work. It is a stable, one hundred per cent natural gasoline made especially for aviation use.

Now available at Chicago, Iowa City, Des Moines, North Platte, Cheyenne, Rock Springs, Salt Lake City, Wichita, Bartlesville and Amarillo airports.

Phillips Petroleum Company

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NATURAL GASOLINE FOR CONTROLLED VOLATILITY

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NATUR

The Super aviation

Airports springing up all over the country present a new opportunity to the oil jobber if he is handling a product that is suitable. Naturaline favors every heed of the Airplane Motor. It is now ready for distribution. Airports could be quickly supplied within your territory. Wherever Naturaline is sold there will be an instant and appreciative recognition by visiting pilots. If you take a Naturaline franchise now you will reap the benefits from the great rush of Aviation development within the next few years. Write for our booklet "Tail winds and happy landings". It will explain your opportunity.

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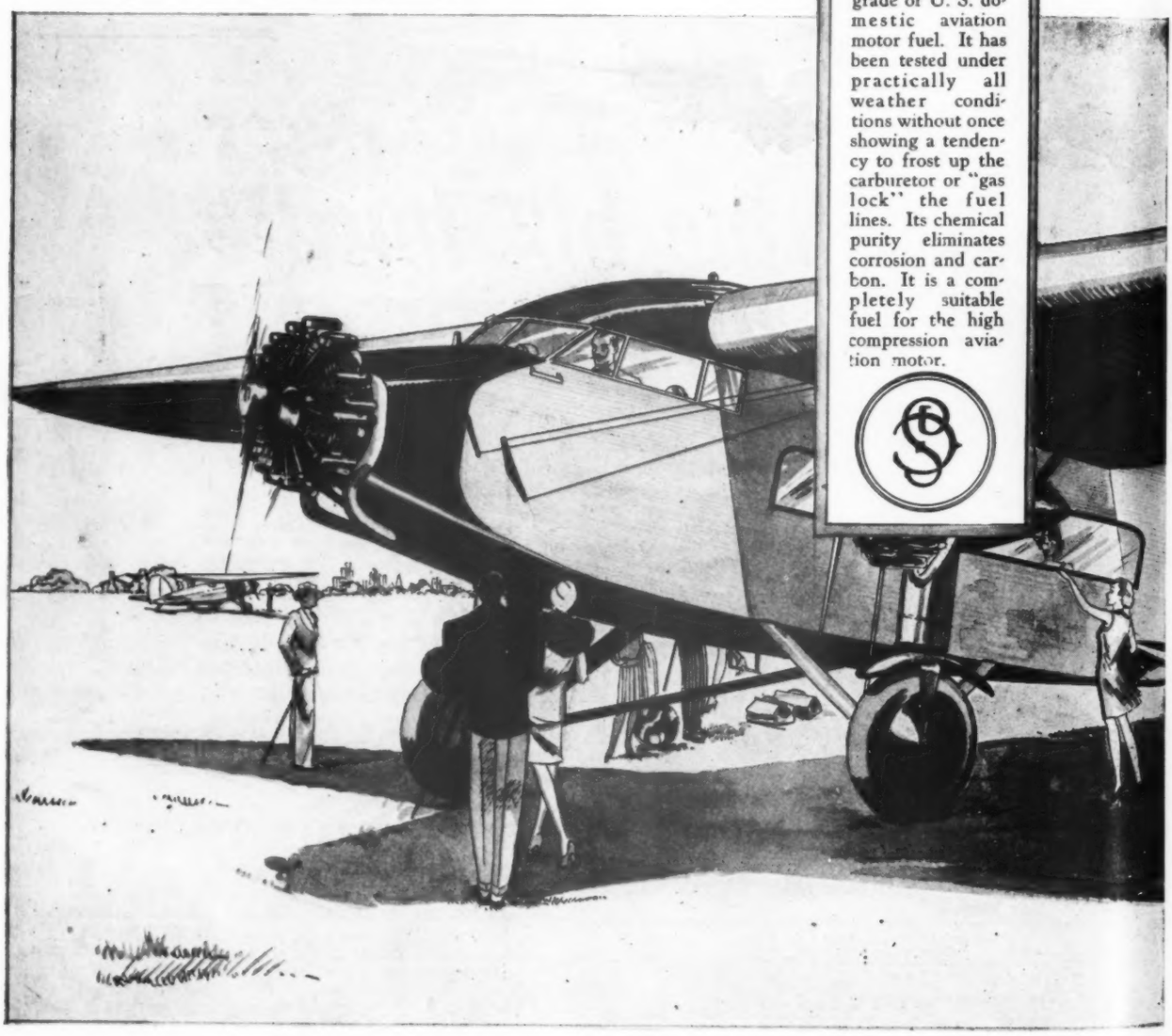
It is forty-six pounds per hundred gallons lighter

than U. S. fighting grade or U. S. domestic aviation motor fuel. It has been tested under practically all weather conditions without once showing a tendency to frost up the carburetor or "gas lock" the fuel lines. Its chemical purity eliminates corrosion and carbon. It is a completely suitable fuel for the high compression aviation motor.



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The urgent need for an aviation fuel came to the realization of Chestnut & Smith Corp. nearly two years ago. It was realized too, that natural gasoline offered probably the most suitable source from which to produce such a fuel.

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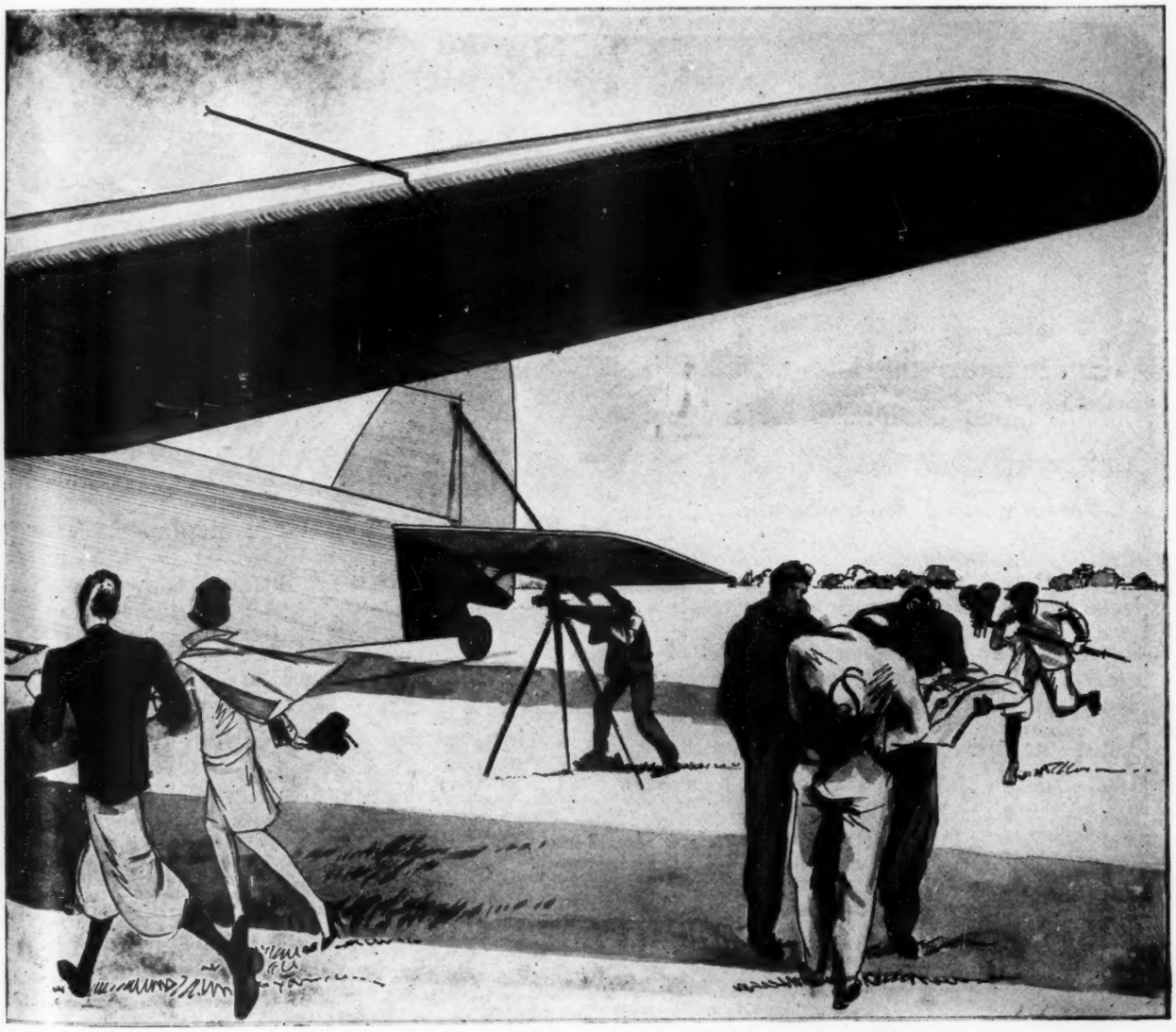
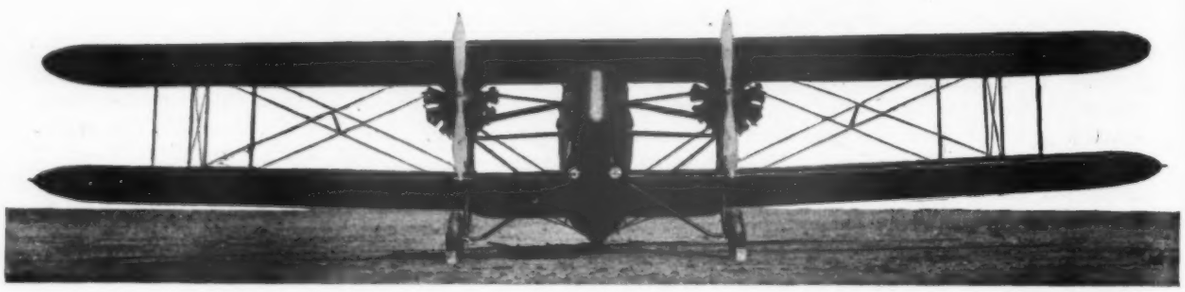


CORPORATION, Tulsa, Okla.

Keystone Wins Again!



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Performance, Maneuverability, Simplicity, Dependability, Low Maintenance were the outstanding features that won the approval of a Board composed of Air Corps Bombardment Experts, chosen to decide on new equipment.

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The Army's choice of the "PANTHER" accentuates KEYSTONE'S standing as builders of large airplanes. The "PATHFINDER" Commercial Transport —accommodating 12 persons—meets the same structural and performance specifications as the Air Corps bomber.

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Builders of Quality Aircraft since 1909
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THERE'S AN IDEAL SPOT FOR YOUR FACTORY....

in

San Diego California

Air Capital of the West

THE CITIZENS and officials of this "air-minded" city invite you to take advantage of the greatest *natural* advantages for aviation and aircraft manufacturing in America—and to make use of Lindbergh Field, the new $650,000.00 Triple-A municipal airport which they are preparing for you, one and one-half miles from the center of the city, on the beautiful shores of San Diego Bay!

You'll be right in your element, here! You'll find great U. S. Govt. activities as well as numerous private aircraft and allied industries, already established. You'll find the world's most equable climate—*cool* in summer, *warm* in winter—enabling you to erect *inexpensive* factory buildings and maintain your plant at full efficiency *every month of the year*, with the least possible invested capital and operating expense! You'll find an unlimited supply of the best aviation mechanics—available at reasonable wages—because living conditions are ideal and living costs are low.

Here, *every* day of the year is a potential "flying" or "testing" day. No delays, no wasted effort, no interruptions in production or flying schedules due to rain, snow, sleet, excessive fog, freezing temperature, high winds, extreme heat or electrical storms . . . . for San Diego's superior climate *eliminates* all these! That, no doubt, is one of the reasons why more aeronautical World's Records have been broken in San Diego than in any other city in the world.

And now, add to San Diego's many other aviation advantages—Lindbergh Field! Choice sites at unusually attractive rates will be available on this magnificent field in the near future. If your plant needs greater facilities, or if you are contemplating the erection of a new aeroplane factory, it will pay you to investigate the opportunities for *more profitable* operation in San Diego. A trip to San Diego will convince you of these facts. Meanwhile . . . . .

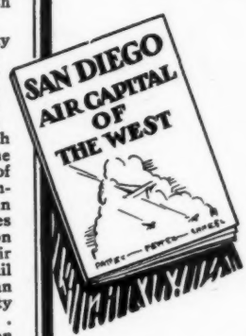
Extracts of
A Report

MADE BY A SPECIAL COMMISSION

Appointed by the Secretary of War to Investigate Sites For an Aviation School

"6. The site for the aviation school . . . . should possess certain geographical, climatological, and topographical characteristics. The site should be located on an ocean or bay and in close vicinity to existing railway lines, with easy access to them. The climatological characteristics should be such as to give the greatest number of working days possible throughout the year, with suitable air, moisture, and temperature conditions, while the topography of the terrain in the vicinity should be such as to contain many incidental features with good landing places . . . .

"7. The terrain in the vicinity of San Diego Bay, Calif., *fulfills the foregoing conditions better than any other section of the United States.* A study of the climatological data of the locations visited by the commission, which was compiled by the Chief of the Weather Bureau at the request of the commission . . . . clearly indicated that the littoral of San Diego Bay contains the best sites for the establishment of an aviation section as far as weather and air conditions are concerned. The rail and water connections at San Diego are ample . . . . The county in the vicinity of San Diego . . . . shows terrain of every description from level land to mountains, *and possesses characteristics that can be found in no other part of the country . . . .*"



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August 16-17

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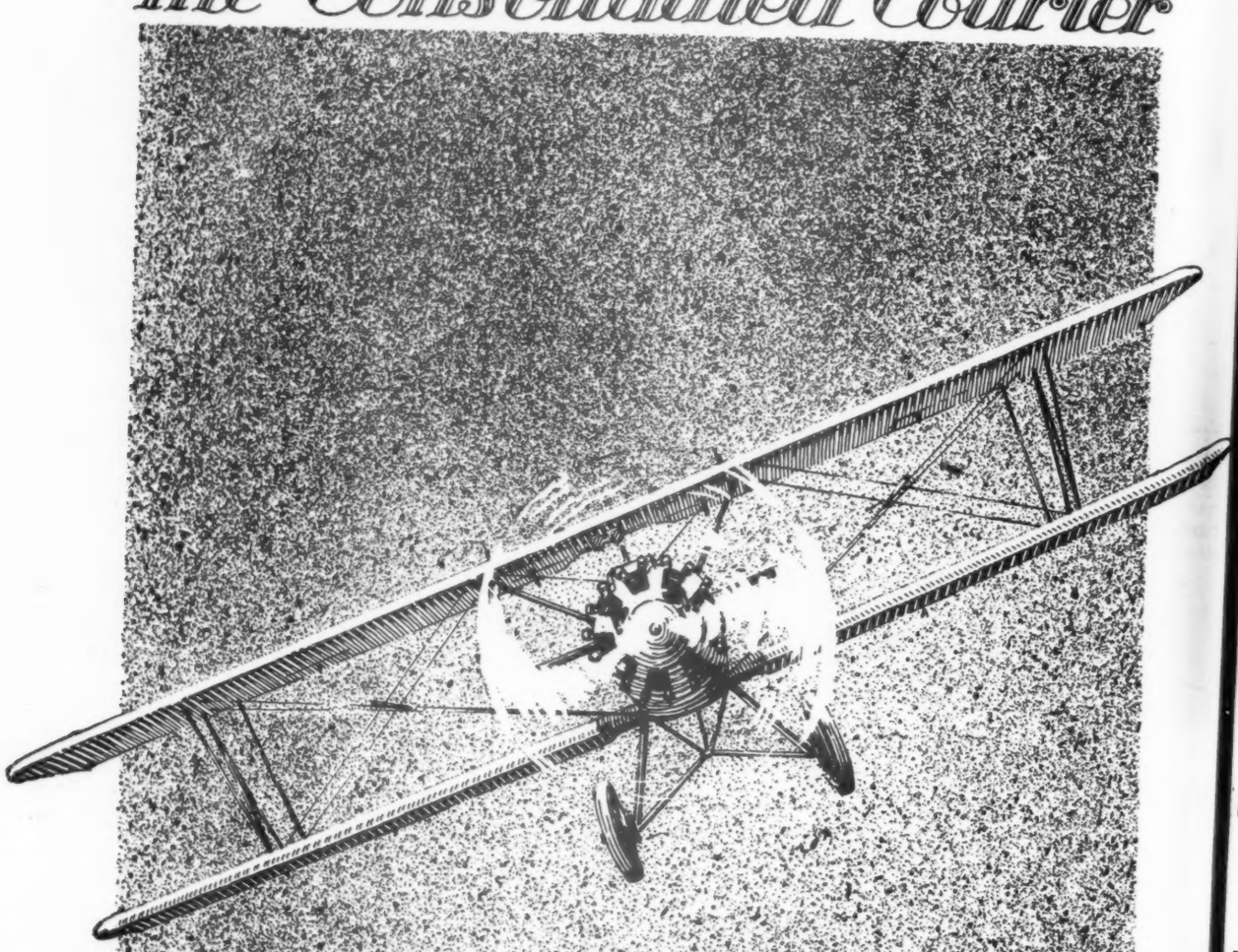
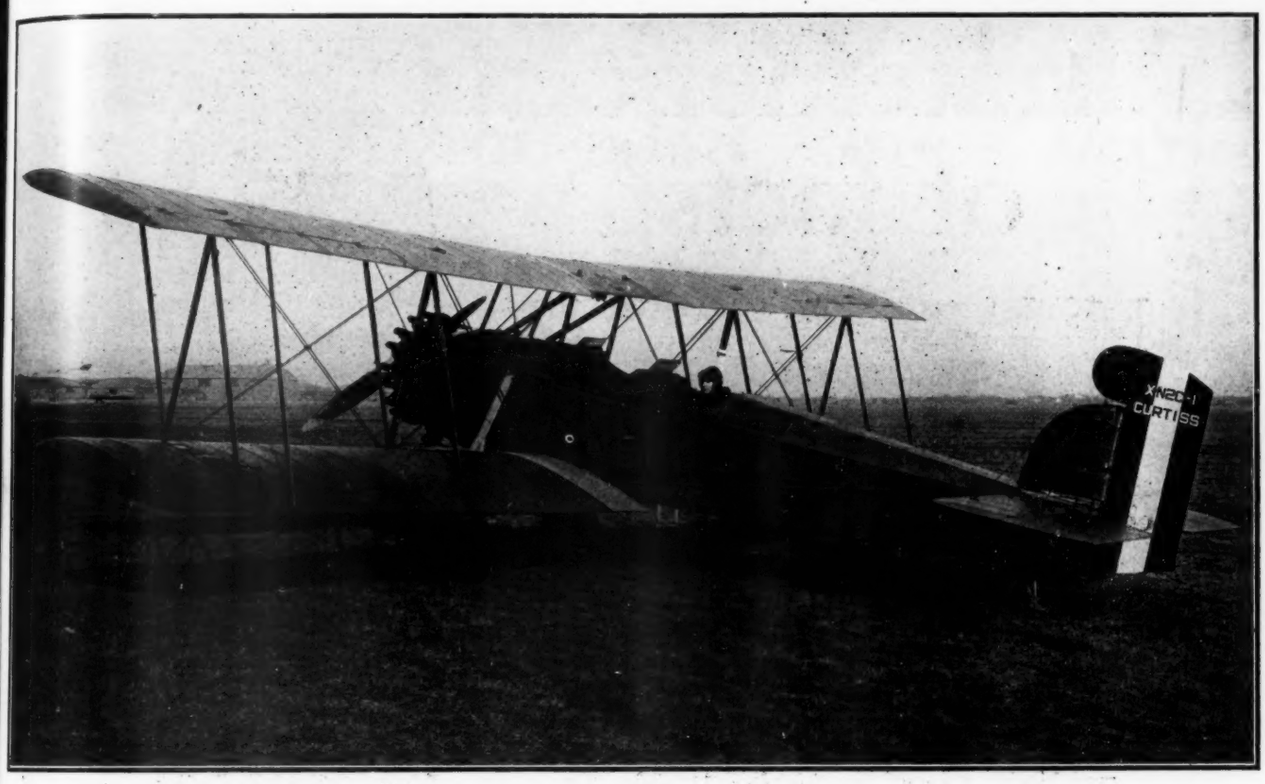


Consolidated Aircraft Corporation
Buffalo, N.Y.

CONSOLIDATED AIRCRAFT

A NEW TRAINING PLANE



The Curtiss Fledgling

THE FLEDGLING was constructed as the winner of a Navy design competition, in which fourteen leading aircratf manufacturers participated.

It is specifically designed for primary and advanced training, either as a land plane or as a seaplane, and is equipped for fixed and flexible gunnery instruction, radio spotting, and bombing.

In design and performance, the Fledgling is eminently representative of 1928 standards for training planes.

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Offices: Garden City, N. Y.; Factories: Garden City and Buffalo, N. Y.

Curtiss

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There are three reasons for this:

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LINDE OXYGEN

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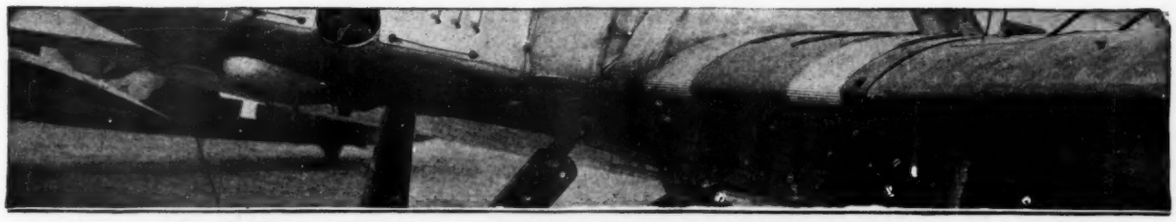

TO HELP YOU DOWN AND UP AGAIN

IMAGINE—dropping an automobile on two wheels! Yet airplane tires take that, perhaps many times a day. Even a perfect 3-point landing gives the tires two-thirds of the job, and more than that when the eye is bad or the field worse.

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Aeronautics Department

THE GOODYEAR TIRE AND RUBBER COMPANY, INC., AKRON, OHIO

GOODYEAR

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AIRPLANE TIRES

THANK YOU *for mentioning* AVIATION

The Fokker F-10 12-passenger high performance transport (3 Wasps)

The Leoning Amphibian 4-passenger cabin plane (Wasp)

The Lockheed Air Mail and passenger plane (Wasp)

Versatility of the Commercial Wasp

The 400 H. P. "Wasp" is demonstrating a most remarkable versatility of application in commercial use. The "Wasp" is now installed in more than twenty various types of commercial ships, including land planes, sea planes, and amphibians, varying from the smaller individually owned four and five passenger cabin planes to giant tri-motor passenger and mail ships. In the service of one transport company alone commercial "Wasp" engines have been flown almost one and one-half million miles, carrying mail and passengers.

THE
PRATT & WHITNEY AIRCRAFT CO.
HARTFORD CONNECTICUT

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AVIATION

The Oldest American Aeronautical Magazine

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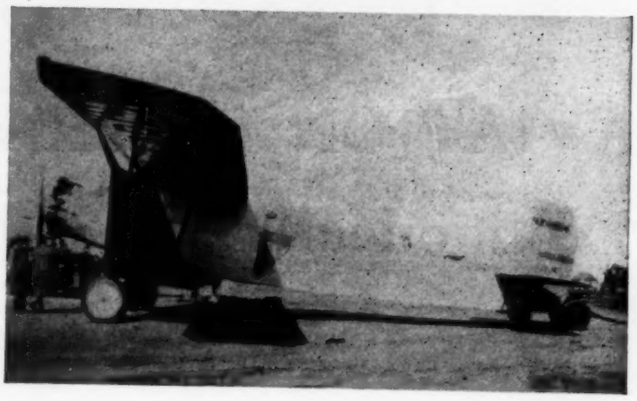

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equipped with

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AVIATION

The Oldest American Aeronautical Magazine

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An Injustice

WHEN AMERICA entered the war there was a rush to get to officers' training camps. Those who volunteered for the Air Service got started just as soon as the others but planes were not ready and the training took longer than that for the other branches of the service. As a result the flying cadets did not get their commissions until after those who had enlisted at the same time.

As our officers are promoted in the order of their receiving their commissions, and as about half of our present force of officers joined at the time of the war, it follows that the Air Corps officers are at the bottom of the list and that they still will be lieutenants while others who joined other branches of the Army after they did will have a much higher rank. This is unfair, not so much from the point of view of pay, for the Air Corps officers get extra compensation for flying, but from the standpoint of moral efficiency. It is a great handicap to the Air Corps to have its officers of lower grade than the officers of other branches of the service who have had an equal amount of experience.

For many years those who knew the situation have been trying to have it remedied by Congressional action but it was not until this year that everything seemed set to have the separate promotion bill go through. The bill introduced by Congressman Furlow had been passed in committee and by the House, but in its hurry to get home the Senate turned it down without any consideration whatsoever. There is no possibility of the bill going through this year but it is of such vital importance to the healthy development of the Air Corps that every influence should be brought to bear to see that it is not side tracked again next year.

Financing the Purchaser

ONE OF the greatest needs of the aircraft industry today is some sort of financing company which would help dealers and aircraft operators to purchase planes before they were able to fully pay for them. Financing companies of this sort are very common in the automobile field and their operations have been so successful that the majority of automobiles purchased in this country are bought on the instalment plan.

The fact that airplane financing companies have not been successful in the past does not mean that they could not be made to work at the present time though it must be admitted that several serious difficulties present themselves. The chief one of these is the accident risk which in times past has proved to be a moral risk about as much as an actual risk. The majority of those who have sought financing have been new to the game or else more or less unsuccessful. As a result they were apt to find at the end of the season that they were not going to be able to pay off the notes as per schedule. Under such circumstances it was a great temptation to be careless in the handling of the plane and there were many accidents on which insurance was collected and it was necessary to boost insurance rates on airplanes, which had not been paid for, up to a prohibitive figure.

Conditions now have changed very considerably. There are a large number of reputable and experienced fixed base operators who could handle a much larger number of planes if they had the working capital. Many of these operators have been in business for a long time and have a good operating record. By using a little discretion there is little doubt that certain operators would make perfectly good risks and that an airplane finance corporation could be established to the benefit of the financiers and to the advancement of the airplane sales.

Schools of Thought

CONTROL BEYOND the stalling speed is engaging an enormous amount of attention at the present time and there is little doubt but that if planes were built so that they would not stall or spin that the safety of aircraft would be greatly increased. At present there are two very different schools of thought on the subject. One claims that by using proper wing sections and by properly distributing the weight it is possible to build a plane which will not get out of control even if it is forced to settle rapidly while on an even keel. The other school believes that it is necessary to provide some auxiliary device which will function when the wing has actually reached the stalling point.

The wonderful demonstrations given recently with the Handley-Page automatic slots have focused much attention on this device and strengthened the point of view of the later school. The development of more stable wing curves has not however been at a standstill. The N.A.C.A. has developed a wing section where the lift instead of rising steadily and then dropping off very suddenly with increasing angle of incidence rises up to a certain point and then continues lifting at about the same level rate so that in a plane with the proper weight distribution a stall or spin would be practically impossible.

It is interesting to have competent engineers so evenly divided on principles which are fundamentally so different but as both schools of thought are working to achieve a very valuable end the laymen will not worry provided that either one or both or a combination achieve the result desired.

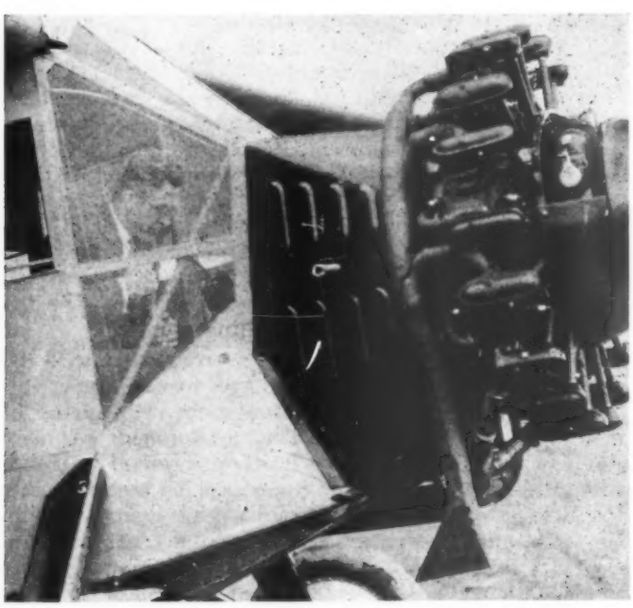
Engine Exhaust Silencers

Brief Descriptions of the Various Designs that Have Been Developed to Eliminate the Noise of the Exhaust

By RICHARD M. MOCK

ELIMINATION OF noise in airplanes seems to be a general tendency in design. The inconveniences of the roar of the power plant are apparent and it is natural that one's attention should be directed to the principal source of noise—the exhaust. Of course, the sounds given off by the propeller, as well as that of the engine itself, are considerable factors, but it would be useless to attempt to eliminate these until the exhaust of the engine has been quieted. Considerable effort, both in this country and abroad, has been directed to the silencing of engine exhaust noises. Abroad, mufflers are more common than in the United States where long exhaust pipes or exhaust manifolds with "silencing" ends are increasing in use.

The loss of engine power, and also the tendency to burn valves when operating in hot climates, through increased back pressure in the exhaust muffler has been one of the "bugbears" of the engineer. However, it has been demonstrated that, with proper design, power loss may be decreased to a minimum, or, in some cases, the engine power increased. In addition, an exhaust silencer, of good design, has the advantage of eliminating the flames of the burning gases from the view of the pilot for night flying. Objections have been raised



Showing the squeeze end type of silencer on the exhaust of a "Whirlwind" installed in a Fairchild monoplane.

because of the increased weight and added air resistance, but with present day refinements in airplane design these objections have been reduced to the point where they are overshadowed by the advantages in the reduction in sound. Apart from the comfort of the airplane passengers, pilots and those living in the vicinity of an airport (which is really paramount), sound reduction is of considerable importance in radio communication with airplanes as well as the deafening effects of long flights.

The standard aircraft engine, on most production planes, has an exhaust manifold which shows little effort to silence the exhaust. The most common type of manifold, on radial engines, is a ring for collecting the exhaust gases and allowing these to escape through vents at the bottom. The engine with the cylinders in line usually has a common collector manifold mounted on each bank of cylinders, with an open-

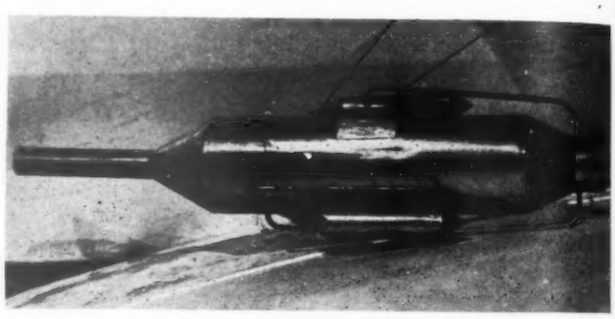


Illustration of the type of muffler being produced by Southern Airways, San Antonio, Tex.

ing at one end. On some designs there are short stacks on each cylinder or a group of cylinders. Each type of exhaust produces a different type of noise, and from casual observation it does not appear that any consideration of the elimination of noise has entered into most manifold designs. Most American engine manufacturers do not supply exhaust manifolds but leave their construction to the airplane manufacturer.

Noises can be eliminated from an engine exhaust by slowly reducing the velocity of the burned gases. This may be accomplished by three methods: regular expansion, change of direction, or surface friction. Most exhaust silencers employ a combination of two or three of these. The simplest type of silencer is the long exhaust pipe, common on some Fokker planes. The exhaust manifold is connected to a flexible tube suspended longitudinally below the fuselage extending back to a point under the cabin. The gases expand gradually as they approach the end of the tube and their velocity is decreased by the friction of the walls of the tube. This method causes only a slight back pressure and the noise can be directed away from the cabin. The usual type of cockpit heater reduces the noise slightly by this method as it requires a somewhat longer exhaust pipe than is normally required.

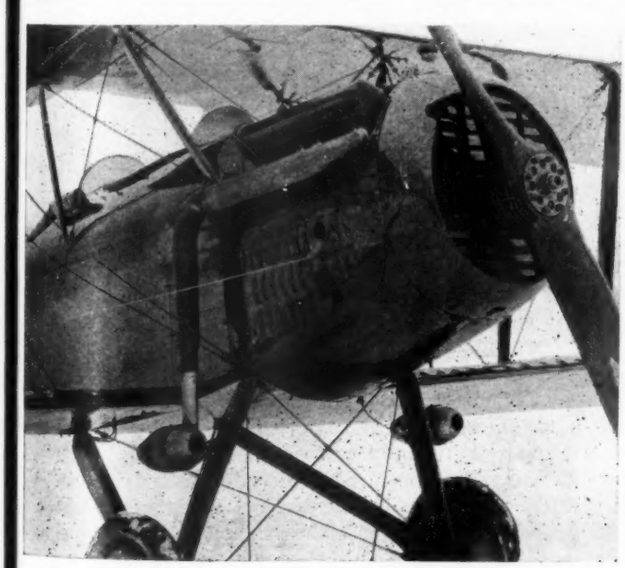
The method of changing the direction of the gases and thus reducing their velocity, such as by the use of baffle plates as on automobile mufflers, causes too great a reduction in power to warrant its use on aircraft engines. In addition, the installation is usually quite heavy. Another method of changing the direction of the gases and thus slowly dissipate their energy is that of the exhaust manifold with the so-called "silencing" ends. The end of the exhaust pipe is either completely sealed or partly closed, while the wall is perforated with small holes having an aggregate opening more than suf-

ficient for the exit of the gases. The silencing end of the exhaust pipe is usually obtained by flattening out the round exhaust pipe near the end, thus obstructing the free exit of the gases. It is understood that this type was first used on Spads during the war. It has the advantage of being able to be combined with the long exhaust pipe, which tends to reduce the noise still further. It causes practically no addition in weight, and only a slight decrease in power. The type with the end completely sealed causes a power loss of approximately one per cent., while with the end partly open the loss is negligible. However, as a noise reducer this type, with the end open, is not as effective as some others.

Standard on Fairchild Planes

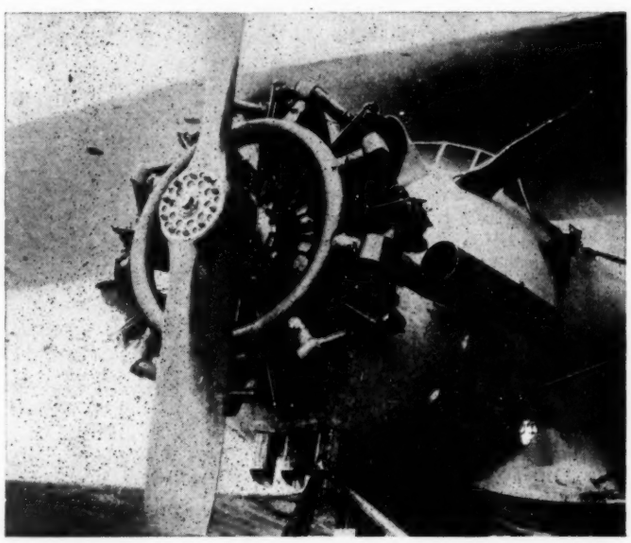
The above type of silencer is now standard equipment on Fairchild planes. The exhaust of the radial engine is carried through a ring manifold with two openings at the bottom, one on each side. One opening is connected to an exhaust pipe fitted with an exhaust heater connected to the cockpit; the other is fitted with a form of silencing end. This pipe appears to be flattened out near end, that is, it tapers in thickness and is widened near the end so that it resembles a triangular wedge. The sides of the wedge are perforated with round holes for the exit of the exhaust gases. According to figures supplied by the Fairchild Company, this type causes an almost negligible power loss; there is a back pressure equal to a column of water one half inch high. The additional weight is only three quarters of a pound and the end reduces the exhaust noise sufficiently to warrant the increased cost of production and the additional weight.

A modification of this type is the "bayonet" or "cone" type of exhaust pipe opening, developed by the Curtiss Aeroplane & Motor Co. This consists of a tapered end to the exhaust pipe. It decreases in cross section towards the end and



Showing combination whir and venturi type muffler developed by the Dayton Wright Airplane Co. installed for test purposes on an Army plane.

has a longitudinal opening running the length of the tapered portion. There are no perforations in the wall, the longitudinal opening being sufficient for the exit of gases. This type is common on radial engines, with one of the silencers on each cylinder. Installations have been made on some engines by having one long "bayonet" exhaust opening on a common manifold for all or a group of cylinders. The end weighs no more than a short exhaust stack and offers less air resistance. The power is hardly affected and the noise is somewhat reduced. This type of exhaust stack, for that is really what it is, can be produced fairly cheaply as it consists only of a sheet metal rolled up into a cone with the seam left open, spaced by washers placed between the pieces of metal. It is understood that it is protected by patents held by the Curtiss company. The type with individual stack for each cylinder, as produced by the Curtiss company, averages 1.3 lb. for the



Rochat-Barthelmy exhaust silencer on a Spad 56 powered with a 380 hp. Jupiter engine. There are two silencers, one on each side, 29½ in. long and weighing 19.85 lb.

Wright Whirlwind and 1.15 lb. each for the Pratt & Whitney Wasp. As the Whirlwind exhaust port is on the side of the cylinder there is a bend in the stack, making it slightly heavier.

A somewhat similar muffler is that now installed on Buhl planes. It consists of a long exhaust pipe carried below the fuselage as far back as the cabin. The pipe tapers in section and has half round openings on one side to provide for the exit of the gases. It is a combination carburetor heater and cabin heater as well as exhaust silencer. It is said to be exceptionally quiet, especially as it carries the noise away from the occupants of the plane. The weight is approximately the same as the usual long exhaust pipe but the installation is more efficient, though more costly. It causes only 0.10 in. of mercury back pressure in the manifold and does not appear to effect the performance of the plane as the engine has the same speed with and without the manifold.

Tests Made on a Liberty Engine

Another type of muffler that decreases the velocity of the rapidly expanding gases, by changing their direction, is the "whirl" type. The gases enter a normal exhaust pipe eccentrically, usually at a tangent to the pipe, which causes the gases to rotate or whirl in the exhaust pipe, slowly reducing their velocity. These mufflers were tested on a Liberty engine (one for each cylinder bank) by the Materiel Division of the Army Air Corps and were found to cause an almost immeasurable decrease in power, being approximately 30 r.p.m. at full throttle. It is stated that the noise was so reduced that on a DH the whistling of the wires, rattle of the valve gear, and noise of the propeller predominated in the sounds which could be heard.

It was stated above that a muffler, if properly designed, would increase the power of an engine. This may be done by utilizing the airstream to create a negative pressure in the engine exhaust manifold and thus reduce the back pressure,

Continued on page 1794

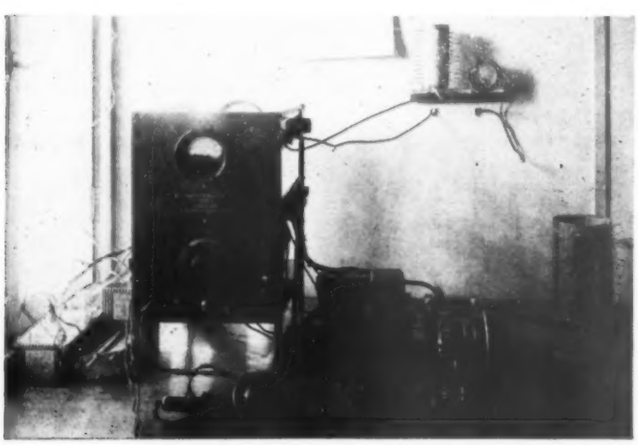
Aircraft Radio Beacon Development

By GEORGE K. BURGESS
Director, Bureau of Standards

A NUMBER of demonstrations have recently been given of the aircraft radio beacon system which has been under intensive development by the Bureau of Standards. The beacon system marks out an invisible but infallible course along which aviators can fly regardless of fog or other weather conditions. To make use of this system, an airplane need only be provided with a small receiving set carrying an indicator. An occasional glance at the indicator tells the pilot whether he is following the course, or how far off if he has deviated from it. The troublesome trailing wire antenna and headphones used in earlier stages of the development have been eliminated. The experimental work is still in progress, but the system is sufficiently perfected that routine use of it on the regular airways is beginning.

With the radio beacon made practical and dependable, air route operations enter a new era of regularity and safety. Most of the trips which are now omitted or undertaken only at great risk can be confidently made. It has been the rule to undertake flights only when weather conditions were favorable enough so that the pilot could see points on the ground, and in the early days of our air mail service flying schedules were frequently interrupted on account of weather conditions.

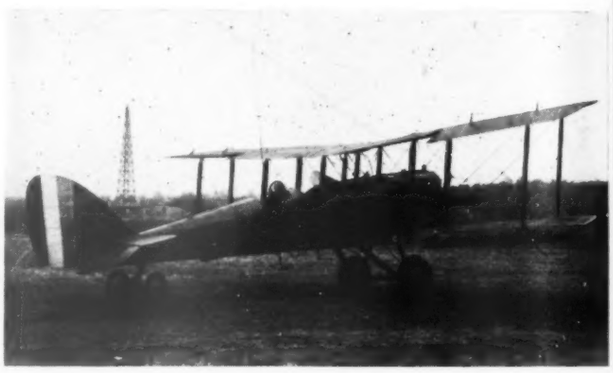
A method of aerial navigation called "instrument flying" has been tried from time to time. When the pilot cannot see the earth below he forgets the outside world and, concentrating all his attention on his instruments, navigates his craft from the information they convey. One instrument tells him his



Marker beacon apparatus.

elevation, another his speed, another whether he is turning or flying straight away, and his compass indicates his general direction. But accurate as all these instruments may be, they do not tell him if he is drifting sidewise due to a cross wind, nor do they tell him exactly at what speed he is traveling because there may also be a head or tail wind to slow him down or to speed him up. Thus while instrument flying may enable a pilot to keep his craft at a safe altitude and in a generally correct direction, the hazard of getting far away from the course into strange, unfamiliar, and possibly dangerous areas is ever present.

What "instrument flying" has hitherto lacked is precisely supplied by the radio beacon system, because with its use the pilot can always know his location. The radio beacon system includes the double-beam directive beacon and smaller stations known as "marker beacons."



Experimental airplane showing the vertical pole antennae.

The first work on the double-beam directive type of radio beacon was done by the Bureau of Standards in 1921 for the Army Air Service. The method consisted of transmitting radio waves alternately from two directive coil antennae placed at an angle with each other. Each antenna transmits a set of waves which is directive, i.e., it is stronger in its own plane than in other directions. When an airplane flies along the line exactly equidistant from the two beams of waves, i.e., on the bisector of the angle between the planes of the two antennae, the pilot hears the signals from the two with equal intensity. If the airplane deviates from this line the signals from one antenna are louder and the other weaker. Equality of received signals thus indicates a fixed line in space and provides a means to guide an observer on any kind of craft along that line. A different signal is used on each antenna, so as to distinguish between them.

In the early work a switch was used to throw the radio-frequency power from one antenna to the other. Tests made at Washington on the ground and on ships showed that a course was effectively marked out, permitting navigation without aid of landmarks, compass, or other navigational device. The apparatus was next set up at Dayton, Ohio, and tests made in the air. The method was successful in airplane flights, and had the important advantages that it required no special apparatus to be carried on the airplane, and that no error was introduced by wind drift.

This original work is described in Bureau of Standards

Scientific Paper No. 480, "A directive type of radio beacon and its application to navigation," by F. H. Engel and F. W. Dunmore. Figs. 1, 2, and 3 of this paper should be especially noted, showing how the directional characteristic of the coil antennae produces the directive effect.

In the following four years, the Army engineers at Dayton, O., developed the beacon further; in particular, they devised a signal-switching arrangement such that the signals from the two antennae merged into a steady dash when on the course, giving an added criterion besides that of equal signal intensity to enable the observer to tell whether he was on or off the course. They also introduced a goniometer, or mutual

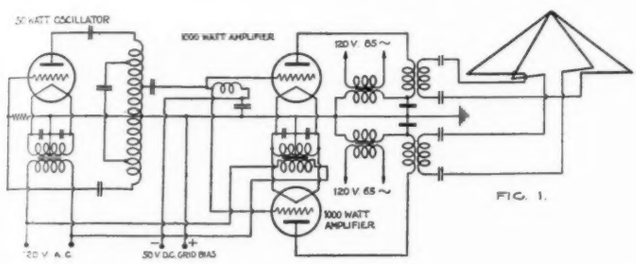


FIG. 1.

inductance device, to permit orienting the course in any desired direction without moving the antennae. The beacon as thus developed is described in "Stationary and rotating equisignal beacons," by W. H. Murphy and L. M. Wolfe, *Journal Soc. Automotive Engineers, 19,* p. 209; Sept., 1926.

Shortly after its formation in July, 1926, the Aeronautics Branch of the Department of Commerce began a program of establishing aids to navigation on the nation's airways. The aids determined upon were: upper air weather information, airways lighting for night flying, and radio aids. It was recognized that radio offered important advantages in the way of communication between the ground and air and also direct navigational assistance. As there had been little or no experience in the use of radio under the conditions of flight on the civil airways in the U. S. (the Air Mail Service did not employ radio on its airplanes), it was not immediately evident what form these radio aids should take.

The Aeronautics Branch assigned the necessary experimentation and development in this field to its research division, which was organized in the Bureau of Standards. As a first step, a conference was called, June 22, 1926, to secure information and advice from various organizations which had experience bearing upon this problem. The recommendations made have been of value to the Department in the developments since that time.

The development of radio aids for the airways was immediately begun, the principal features to be radio telephony

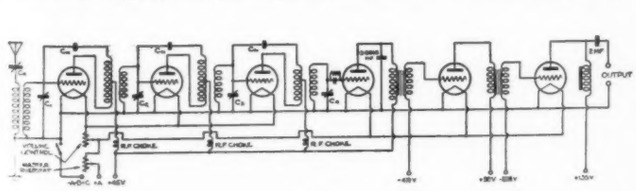


FIG. 3

from ground to aircraft, and a radio beacon system. One of the major considerations in narrowing the choice of radio aids to these two was the idea of minimizing the apparatus which would have to be carried aboard the airplanes. The system adopted requires only a simple receiving set to be carried by an airplane. With this set it receives radio telephone information on weather conditions, etc., and also the radio beacon signals to guide it along its course. All of the complicated and expensive apparatus is on the ground at the transmitting end, to be maintained by the Government. A description of the general system, and discussion of the considerations affecting it, are given in "Applications of radio in air navigation," by J. H. Dellinger, *Engineers and Engineering, 43,* p. 301; Nov. 1926; *Mechanical Engineering, 49,* p. 29; Jan. 1927.

The experimental work done in 1927 made it apparent that this system is entirely practicable and that all technical requirements will be met by placing the radio telephone transmitting stations and the main beacon stations at the principal airports, something like two hundred miles apart. The Department of Commerce has begun the purchase of apparatus to make a number of the installations.

It has been demonstrated that the use of radio telephony to transmit weather and other important navigational information to the airplanes while in flight is thoroughly practicable. In public demonstrations in May, 1927, Hon. W. P. MacCracken, assistant secretary of commerce for aeronautics, and Dr. G. K. Burgess, director of the Bureau of Standards, held conversations from their desks with other officials in airplanes. In one case the whole two-way conversation was broadcasted to the radio public from station WRC.

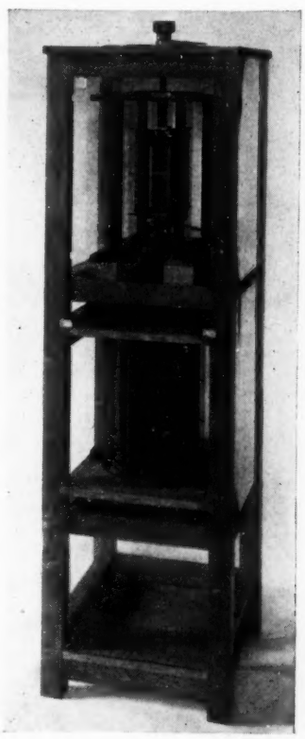


Fig. 2. Goniometer used to shift course in any desired direction.

This discussion is limited to the work on the radio beacon system. When the specific development of the beacon for the civil airways was begun in 1926, several improvements over the existing form of beacon were sought. These included some matters of design detail (involving the goniometer, interlocking switch, etc.), an automatic device for setting the course successively on several courses (for use at airports where several courses intersect), and means of replacing the telephone receivers by a visual indicator. The work has been done at two field stations, one at College Park, Md., a suburb of Washington, and the other at Bellefonte, Penna., chosen because of its location on the New York-Cleveland airway in particular hazardous mountain terrain. These two stations are equipped with radio beacon and also radio telephone and telegraph transmitting apparatus. They serve as development laboratories and as model and demonstration stations, and are in addition available to give radio service to the air routes on which they are located.

At College Park there is a directive radio beacon which is equipped to send signals of the aural interlocking variety, and also to send signals modulated at two low frequencies necessary for the visual indicator system that the Bureau has developed. The College Park station is equipped with other special types of equipment for the sending of signals for experimental purposes. At Bellefonte the directive radio beacon is being remodeled so that it can send signals for use of the visual system in addition to the aural system.

During May three airplanes of the National Air Transport, Inc., using the Bellefonte station, and three airplanes of Pitcairn Aviation, Inc., using the College Park station, will

Continued on page 1798

Fuselage Analysis

Stress Analysis of Commercial Aircraft, Chapter Number Fourteen

By PROFESSOR ALEXANDER KLEMIN
Daniel Guggenheim School of Aeronautics

And GEORGE F. TITTERTON
Late of the Bureau of Aeronautics, Navy Department

IN THE three-point landing analysis the plane is assumed resting on the wheels and tail skid. The panel weights are acting vertically downward perpendicular to the ground line. They are balanced by reactions at the wheels and tail skid. The magnitude of these reactions and the loads transmitted by the chassis struts to the fuselage may be obtained from the chassis analysis of Chapter 10. These are all the forces acting in this condition and when they are in equilibrium the graphical solution may be made.

The design panel loads for this condition may be obtained as in the following table. These design panel loads are identical with the vertical components of the panel loads in the level landing condition. They need not be refigured then as we have done in the following table. It has been done below merely to show that they actually are equal. These panel loads are applied perpendicular to the ground line as shown in Fig. 80.

Design Panel Loads—Three-Point Landing.

Panel Point	(1) Unit Panel Loads	(2) Panel Loads due to Chassis	(3) = (1) — (2) Unit Panel Loads without Chassis	(4) = (3) × 6.5/2 Design Panel Loads
1U	15		15	48.8
1L	23.4		23.4	76
2U	58		58	188
2L	45.6		45.6	148.3
3	142.5	80	62.5	204
4	456.5		456.5	1485
5	301	50	251	815
6	479		479	1558
7	154		154	498
8	10		10	32.5
9	5		5	16.3
10	6		6	19.5
11	5		5	16.3
12	5		5	16.3
13U	5		5	16.3
13L	14.7		14.7	47.7
14U	55		55	179
14L	4.3		4.3	14
a	65		65	211
b	360		360	1170
Totals	2210	130	2080	6760

As in the previous conditions panel points a and b will be combined into one point 6.32 in. back of the prop flange. The load at this point will be 211 plus 1170 equals 1381 lb.

Referring back to the three-point landing analysis in Chapter 10 we will now determine the loads in the chassis struts and at the tail skid. This has been done in the following table. As in the case of level landing we must divide by 1.143 to obtain the loads on the fuselage. It will be recalled that 1.143 is the correction factor which we applied when we moved our forces from the center of the wheel hub to the strut joint.

Chassis Reactions—Three Point Landing.

Strut	Stress in 3-Pt. Landing	V/L	Vert. Comp.	V/1.143	D/L	Drag Comp.	D/1.143	Panel Point
Front Strut	943	.456	—430	—374	.350	330	288	3
Absorber "	—9000	.939	8450	7385	0	0	0	4
Rear Strut	3207	.394	—1266	—1106	.551	—1769	—1544	5

From table:

Summation V: $-374 + 7385 - 1106 = 5905$ lb. acting up.

Summation D: $288 - 1544 = -1256$ lb. acting forward.

$$\text{Resultant} = \sqrt{5905^2 + 1256^2} = 6040 \text{ lb.}$$

This resultant of 6040 lb. is exactly equal to the reaction at point of contact of the wheel and the ground. It must be remembered that V and D above are with respect to the propeller axis. They are drawn perpendicular and parallel respectively to this axis in Fig. 80. Since the resultant of the chassis reactions equals only 6040 lb. and our panel loads total 6760 lb. our V and D forces are not yet balanced. The load of 720 lb. needed for equilibrium is the tail skid reaction. In Chapter 10 the reaction at the skid for unit load is 225 lb. This multiplied by half the load factor (for one side of fuselage) is $225 \times 6.5/2 = 720$ lb. This load acts perpendicular to the ground line. Our V and D forces are now equal to zero.

It now remains to make summation M equal to zero to bring the entire system into equilibrium. The moments due to the chassis strut reactions are computed in the following table.

Moments of Chassis Reactions

Strut	Reaction	Magnitude	Arm	Moment	Panel Point
Front Strut	Vertical	—374	26.45	—9,900	3
	Drag	288	—35.88	—10,350	3
Absorber Strut	Vertical	7385	14.95	110,300	4
	Drag	0	—	—	-
Rear Strut	Vertical	—1106	—6.05	6,700	5
	Drag	—1544	—35.88	55,500	5

Forces acting up and back are positive.

Distances measured above and forward of C. G. are positive. The total moment of the chassis reactions is 152,250 in. lb.

The tail skid reaction exerts a very large negative moment on the plane. Its value is $720 \times (287 - 73.95) \cos 12° = -151{,}925$ in. lb. It will be noted that our tail skid load was placed at panel point 13L whereas it actually acts about six inches to the rear of this point. This is an approximation for convenience which has very little effect upon the magnitude of the loads in the fuselage members. The arm of the moment of this load was multiplied by the cos 12° because the fuselage truss is inclined at that angle and the moment arm is actually shorter than the horizontal distance between the panel point and C. G.

Location	Mem.	Elev. & Stab. Load	Fin & Rudder Load	Nosing Over	H.I. & Torque	L.I.	Level Landing	3-Point Landing	Design Cond.	Design Load	Length	Material	Size	Allowable Load	M.S.
Upper Long.	1			-3100	1180		1640	1200	N.O.	-3100	26	Chrome-Molyb	1"-.035	-5400	.74
	2				2835		1600	-100	H.I.	2835	43	"	1"-.035	9555	2.36
	3	1825	±2060		1460		900	-1220	F.+R.	-2060	47	"	1"-.035	-3200	.55
	4	1675	±1575		1300		760	-1030	F.+R.	-1575	48	"	7/8-.035	-2000	.27
	5	1386	±1575		1025		580	-650	F.+R.	-1575	54	"	7/8-.035	-1600	.01
	6	720	±1575		495		266	260	F.+R.	-1575	38	"	3/4-.035	-2000	.27
	7	716	±1575		490		250	230	F.+R.	-1575	30	"	3/4-.035	-3000	.91
Lower Long.	8			-1100	-2440		-950	-1280	H.I.	-2440	13	"	1"-.035	-5600	1.30
	9			-300	-2595		-2980	-2000	L.L.	-2980	33	"	1"-.035	-4800	.61
	10	-1880			-1840		-1500	1090	E.+S.	-1880	48	"	7/8-.035	-2000	.06
	11	-1760			-1415		-920	1070	E.+S.	-1760	48	"	"	-2000	.13
	12	-1575			-1200		-760	810	E.+S.	-1575	54	"	"	-1600	.01
	13	-1203			-860		-526	300	E.+S.	-1203	68	"	"	-1360	.13
	14						-3	4	—	——	30	"	"	—	—
Side Truss	15			-1000	180		450	500	N.O.	-1000	40	"	3/4-.035	-1720	.72
	16			1950	-545		-600	-750	N.O. / 3-Pt.	1750 / -750	49	"	"	2080 / -1150	.57
	17			-1100	2305		3540	2100	N.O. / L.L.	-1100 / 3540	61	"	7/8-.035	-1230 / 6810	.12
	18				-3520		2860	3430	H.I.	-3520	68	"	1 1/4-.035	-3580	.02
	19				-2150		-2400	-1820	L.L.	-2400	64	"	1 1/8-.035	-2480	.03
	20	150			790		700	380	H.I.	790	63	"	5/8-.035	5836	6.38
	21	-165			-225		-190	160	H.I.	-225	54	"	"	-550	1.44
	22	186			235		180	-200	3-Pt.	-200	64	"	"	-550	1.75
	23	-200			-220		-150	260	H.I.	-220	46	"	"	-780	2.54
	24	290			270		180	-390	3-Pt.	-690	49	"	"	-650	.66
	25	-300			-270		-190	400	E.+S.	-300	86	"	"	-1240	3.13
	26	585			450		300	-800	3-Pt.	-800	45	"	3/4-.035	-1400	.75
	27	90			60		10	-10	E.+S.	90	21	"	"	-3960	42.—
	28	-880			-600		-310	-300	E.+S.	-880	37	"	"	-2080	1.36
	29				15		14	12	—	——	18	"	(Designed by Tail Analysis)		
Engine Mount	30			-4500	-760		-690	-980	N.O.	-4500	(ring)	1025 Steel	1"-.049	—	—
	31				250		880	480	L.L.	880	22	"	"	8050	8.15
	32			-3100	810		550	600	N.O.	-3100	28	"	"	-4000	.29
	33			3400	-870		-700	-650	N.O. / H.I.	3400 / -870	30	"	"	8050 / -3900	1.36
	34			-4000	-1490		-420	-850	N.O.	-4000	24	"	"	-4300	.075
Top Truss	35				-90						80	Chrome-Molyb	1-.049		
	36				270		(Axia) Spar Load - H.I.			-9200	36	"	1 1/4-.058	-10500	.14
	37				-360				H.I	-360	56	"	3/4-.035	-900	1.50
	38						(Axia) Spar Load - L.I.			?	36	"			
	39		±615						F.+R.	-615	60	"	3/4-.035	-800	.30
	40		±180						F.+R.	-180	36	"	5/8-.035	-1250	5.94
	41		±410						F.+R.	-410	56	"	"	-500	.22
	42		±270						F.+R.	-270	26	"	"	-2380	7.80
	43		±1100						F.+R	-1100	58	"	7/8-.035	-1660	.23
	44										14	"	5/8-.035		
	45										6	"	"		
Bottom Truss	46										30	"	1-.049		
	47										36	"	"		
	48										36	"	"		
	49										47	"	"		
	50						(strut Side Load - I.F.)			-5148	36	"	"	-6100	.18
	51										60	"	3/4-.035		
	52										36	"	"		
	53										57	"	5/8-.035		
	54										27	"	"		
	55										58	"	"		
	56										16	"	"		
	57										58	"	"		
	58										5	"	1"-.049		
Diagonals	59											"	5/8-.035		
	60											"	"		
	61											"	"		
	62											"	"		
	63											"	"		
	64											"	"		

Design of Fuselage Members

The sum of the moments of chassis and tail skid reactions leaves a positive moment of 325 in. lb. which must be counteracted. This will be done by placing a couple at panel points three and four as was done in the level landing analysis. The value of this couple is 325/32.5 = 10 lb. This couple must be negative to counteract the positive moment and therefore acts down at 3 and up at 5. In order to realize the full moment arm of 32.5 in. between panel points 3 and 4 these 10 lb. forces must act perpendicular to the propeller axis. They have been added to the V reactions in Fig. 80.

Our moments are now balanced so far as the reactions are

Continued on page 1790

The Wallace Touroplane

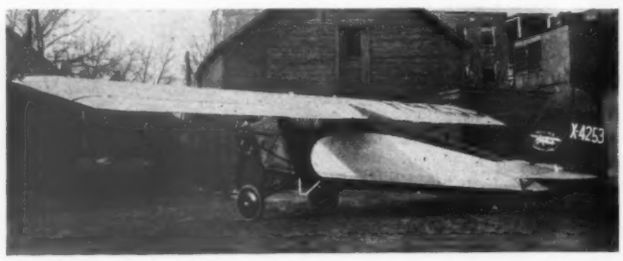
Two and Three Place Models of Folding Wing, Cabin Monoplane Differ Only in Seating Arrangement and Engine Installation

MANY FAVORABLE comments have been made on the Wallace Touroplane, now being put into production by the Wallace Aircraft Co., Chicago, Ill. It is a light, two or three place, folding wing monoplane with the occupants sitting in a closed cabin under the wing. The two place model is powered with an 80 hp. Anzani engine and differs from the three place model only in engine installation and seating arrangement. The three place design is powered with a 120 hp. Anzani engine with the mount such that a 125 hp. Ryan-Siemens, 130 hp. Fairchild-Caminez, or 220 hp. Wright Whirlwind can be substituted. The two place plane weighs 1500 lb. empty and has, it is stated, a high speed of 97.1 m.p.h. over a measured course. The landing speed is 43.1 m.p.h. and climb 670 f.p.m. The three place model with an Anzani engine weighs 2000 lb. loaded and has a top speed of 120 m.p.h. with a landing speed of 48 m.p.h.

Wing Area is 205 Sq. Ft.

Perhaps one of the most interesting features of the Touroplane is the wing. It employs an S.T.Ae. 10c airfoil tested in the Eiffel wind tunnel. According to figures supplied by Stanley Wallace, designer of the plane, it has a maximum absolute lift coefficient of 1.56 (Ky = .00399) and a minimum absolute resistance coefficient of .0175 (Kx = .0000301). The maximum L/D is 19.6. The airfoil is of moderately thick section with a decided Philips entry and slightly depressed trailing edge. Including the ailerons, the wing area is 205 sq. ft. The span is 37 ft. and chord 5 ft. 10 in. Structurally the wing is of conventional design, constructed so that it may be easily folded. The center section extends beyond each side of the fuselage and its trailing edge hinges about the rear spar to provide a recess for the trailing edge of the outer panel of the main wing. The outer panels are attached by vertical pins at the spar points and at the fittings for the wing brace struts. The pins in the forward spar and at the lower end of the forward strut can be removed and the wings rotated about the rear spar and rear wing brace strut points. To support the front spar, when the wings are folded, the forward bracing strut is attached, at its lower end, to a fitting on the rear strut.

The wings are constructed of wood, using solid section Posey spruce spars and built up Warren truss ribs. The spars are not routed and are the same size, front and rear. The ribs are made of 5/16 in. square spruce capstrips with 1/16 in. mahogany gusset plates glued and tacked to the ribs at the joints. These ribs were tested at New York University and found to have a wide margin of safety over the required load. The drag truss wires are 10-32 swaged wire. They are double, one set of wires lying in the plane of the top of the spars and the other set at the bottom. Compression struts except at the point where the wing panels are hinged to the center section, are formed by gluing and nailing spruce strips to either side of a former rib, in the plane of the top and bottom drag trusses. The compression strut at the center section is an N made up of three pieces of ¾ in. by .035 in. steel tubing. It is made integral with the fittings which attach to the front and rear spars of the wing panels. The wings are covered with Flightex fabric and tape and reinforcing type is placed over the ribs.



Rear quarter view of the Wallace Touroplane.

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Front quarter view of the Wallace Touroplane powered with an 80 hp. Anzani engine.

Aero Club *of* New Brunswick

Some General Information Regarding Its Formation and Activities Together With Its Constitution and By-Laws

By JOHN FUCHS
Secretary, Aero Club of New Brunswick

A GROUP of interested persons organized the Aero Club of New Brunswick, N. J., Sept. 17, 1926. One of the first acts to be done was to incorporate. We divided our members into two classifications. The associate members are the non-flying members and the active members are the flying members. In order to become an associate member all that was necessary was to pay one year's dues in advance. To become an active member required an initiation fee of $200 which was to be placed in a separate fund for the purpose of purchasing a plane. At the present time we have 12 active members and approximately 85 associate members. With the money obtained from the active members the Aero Club of New Brunswick, N. J., purchased a Pitcairn Orowing, the plane which the Club now flies. This organization has to separate bank accounts—the associate account and the active account.

Only Active Members May Fly

Active members only may fly the Club's plane. It costs $15 per hour for any active member to use the Club's plane. Associate members may fly with active members. Persons not a member of the organization cannot fly in the club's plane.

In order to interest all associate members in aviation, out of the $6.00 per year which an associate member pays, as dues for the year, also pays for a subscription to AVIATION. Feeling as we do, it is our duty to sell aeronautics to skeptic and non-believers who may join the Aero Club for purposes of moral support. Since many of our members have been receiving AVIATION they have become more interested in the advancement of aeronautics and a good number of them who have never taken rides before are now flying.

At the present time the Aero Club of New Brunswick, N. J., is sponsoring a Junior Air Derby for boys of the ages ranging from nine to 18. The purpose of this Junior Air Derby is for boys to build their own models, be they flying models or merely to scale, and in this way interest both the children and the parents in aviation. When the application for such entries closed there were over 40 entries and the same promises to be highly successful. We nave business men, educators and manual training teachers as our judges.

At every meeting we have experts of some phase of aviation address the Club members. Some of the speakers whom we have had are: Lieutenant Commander Miller, formerly of the U. S. Navy; George Andrus, U. S. Department of Agriculture, weather expert; Mr. Pease, of the Pioneer Instrument Co., and Otto Lunde of the Daniel Guggenheim School of Aeronautics.

The Aero Club of New Brunswick is a success financially and is successful in carrying out its ideas of selling the idea of flying to the people in and about New Brunswick, N. J.

The Aero Club of New Brunswick, N. J., does not teach its active members how to fly. We feel that such instruction should be obtained from some legitimate school established for that purpose, and then after such instructions are obtained, and the student knows how to fly, he may join as an active member and may secure the use of the Club plane to continue his flying. We found out that it is far more desirable that such instructions be obtained at a competent school.

The following are the flying rules of the club:

(1) Strict observance of all Air Commerce Regulations.
(2) All pilots to keep log.
(3) No passengers to be carried under 10 hr. solo.
(4) No flying after sunset.
(5) No cross-country flights until pilot has had 15 hr. solo and has received instruction in same.
(6) Only one control stick to be in plane unless transport pilot is present.
(7) All members should realize that physical fitness is essential to the successful piloting of aircraft and should act accordingly.
(8) No acrobatics unless transport pilot is in plane.
(9) Custodian to be judge of flying weather conditions.
(10) Cross country flights to be discontinued if bad weather threatens.
(11) If mechanical trouble develops test flight should be made by transport pilot.
(12) Flights to be paid for before leaving field.
(13) Plane to be secured by pilot at completion of each flight; except when plane is to be used again in immediate future.
(14) Every pilot who has not flown within 15 days must be checked out by custodian.
(15) All pilots before flight must make entry in Club log, also on return from flight, sign in and sign out.
(16) Pilots will be held responsible for damage if any of the above rules are violated.

CONSTITUTION AND BY-LAWS OF THE AERO CLUB OF NEW BRUNSWICK, NEW JERSEY

CONSTITUTION

Article 1.

This organization shall be known as THE AERO CLUB OF NEW BRUNSWICK, New Jersey.

Article 2.

This club is formed for the following purposes:—

(1) To assist in furthering aviation activities in this vicinity.
(2) To obtain for New Brunswick a municipal airport.
(3) To secure legislation; to further commercial aviation. All persons interested in aeronautics are eligible to membership.

Article 3.

The membership of this organization shall consist of members known as active and associate members. The qualification of each group is to be determined by the By-Laws.

Article 4.

The administration of the club shall be in the hands of the duly elected officers hereafter designated in the By-Laws.

Article 5.

The Constitution may be amended at any meeting of the club by a vote of a majority of the members present provid-

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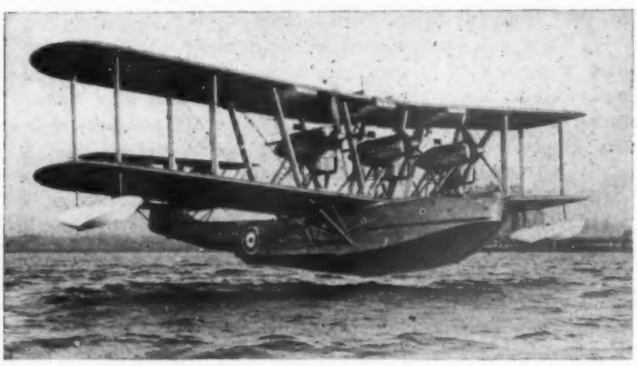
Blackburn Company of England Develops Long Range, Coastal Patrol Flying Boat

A RECENT design of the Blackburn Aeroplane & Motor Co., Ltd., Olympia, Leeds, England, is the Blackburn "Iris II", a large, long range reconnaissance and coastal patrol flying boat powered with three Rolls-Royce 650 hp. engines. It carries a military load of 3622 lb., in addition to 6525 lb. including crew and equipment, giving it a gross weight of 27,000 lb. With this load it is stated to have a high speed of 89.5 m.p.h., a cruising speed of 69.5 m.p.h., and a landing speed of 43.4 m.p.h. It climbs at 700 f.p.m. and is said to take off in 24 seconds. The service ceiling is 12,800 ft. At cruising speed it is said to have a range of 574 mi. and at high speed a range of 537 mi. It is stated that in the design of the hull 1000 lb. have been saved by constructing it of metal rather than of wood. Of this, 400 lb. were saved on the actual structure, the metal eliminating practically 600 lb. due to water soakage.

As a military plane it is designed to carry a crew of five: a pilot, a navigator who also acts as gunner or second pilot,



Recently completed in England, the Blackburn "Iris II" Military Flying Boat is powered by three Rolls-Royce 650 hp. engines.

a wireless operator, an engineer gunner, and an additional gunner. A gun is mounted on a flexible mount on the nose in front of the cockpit. The interior of the hull is very large and roomy. An engineer gunner is stationed in the rear, while the interior houses the wireless apparatus, with space behind this for five sleeping bunks, cooking, stores, etc. At the very tail, below the rudder, a machine gun is mounted for firing to the rear.

In construction, the hull is entirely of duralumin with the exception of the fittings for the wing and tail surface attachments which are of stainless steel. The hull is of two step design with a concave V bottom. The wings are of multi-bay biplane design and composite construction, using wooden spars and ribs, with the internal bracing of duralumin tubes for compression members and steel tie-rods. Three engines are carried between the wings, each below a fuel tank of 302 gal. These engines are mounted on a steel tube structure.

Post Office Department to Issue a New Series of Special Handling Stamps July 1

POSTMASTER GENERAL New has announced that, effective July 1, a new series of special handling stamps in denominations of 10, 15, and 20 cents will be issued by the Post Office Department to conform to the rates provided by recent postal legislation. These stamps will take the place of the 25 cent special handling stamp now in use.

The new stamps will be of the same size and shape as the current one and will have within a circle in the center of each one the numerals "10", "15", and "20", with the words "special handling" arranged in a semicircle directly above. The background will be of ornamental lathe work and the entire stamp will be enclosed within a straight line border. The color will be dark green.

N.A.T. to Establish a Chicago-New York Passenger Service Within Eight Months

PASSENGER AIR service between Chicago, Toledo, Detroit, Cleveland, and New York is to be established within eight months by National Air Transport, Inc., according to an announcement by Col. Paul Henderson, vice president and general manager of the company. The Chicago-New York flight is to be made in seven hours, thus bettering the fastest train time by 13 hr.

The first unit to be launched will consist of seven multi-engined planes, the type yet to be named, carrying 12 to 14 passengers, two pilots, and a cabin steward, who will serve a buffet lunch en route. The fleet of planes will cost $500,000. The latest type of radio beacon guiding instruments will be used on the line. While it has not been definitely decided what fare will be charged, Colonel Henderson said, "We will follow railroad practice and charge rates reasonably advanced to represent the time saved over slower means of transportation. We have a man in Europe at the present time studying the latest developments on the foreign air lines and we will provide every luxury for the comfort and convenience of the passengers that they would expect to have on a modern Pullman train."

Financing of the new service reveals that National Air Transport will use $500,000 of the new capital to buy 50,000 shares of Transcontinental Air Transport, Inc., stock. The latter concern was recently organized to operate a combined plane and rail service from New York to Los Angeles.

N.A.T. has been handling passengers on regular daily schedules on the southwestern division for five months and has been handling passengers in emergencies ever since the beginning of its operations in May 1926.

Bids for Air Mail Service Linking Canada And United States to be Opened June 25

WITH ESTABLISHMENT of air mail service linking the United States and Canada approved by the Postmaster General, bids will be opened, it is announced, on June 25 for the carrying of mail by air on the proposed route from New York City to Montreal, one way for a period of 10 yr. The service is to begin not later than six months after award of the contract and calls for one trip daily except Sundays. The maximum mail load which may be required for a trip is 1,000 lb. and the approximate mileage is 332 mi.

The act of March 8, 1928, under authority of which bids have been asked for this route, provides that the rate to be paid shall not exceed two dollars per mile. No bid, therefore will be accepted at a higher rate than the maximum fixed by law.

The Canadian government already has made a contract with the Colonial Canadian Air Lines, a subsidiary corporation of the Colonial Air Transport, Inc., and the Colonial Western Airways, Inc., which have contracts from Boston to New York and Albany to Cleveland to provide for air mail service on the southbound trip from Montreal to New York.

The Department states that each bid must be accompanied by a bond of $15,000. Contractors, furthermore, must make their own arrangements for landing fields, radio stations, and such other navigation aids.

Air Mail on Contract Routes Increases From 171,028 Lb. to 199,284 Lb. in May

ACCORDING TO figures made public by Postmaster General New, there was an increase of 28,256 lb. of mail carried over the 19 contract air mail routes throughout the country for the month of May 1928, as against the previous month. There was a total of 199,284 lb. of mail carried over the air mail routes during the month of May 1928, while for April 1928, the total in pounds was but 171,028.

The figures for the routes, together with the weight in pounds of mail carried for May 1928 follow:

Route	Weight
Boston-New York	3,291
Chicago-St. Louis	3,268
Chicago-Kansas City-Dallas (day and night)	13,448
Salt Lake City-Los Angeles	21,747
Salt Lake City-Pasco	7,471
Detroit-Cleveland	144
Detroit-Chicago	1,524
Seattle-Los Angeles	8,111
Chicago-Minneapolis	4,137
Cleveland-Pittsburgh	2,550
Cheyenne-Pueblo	3,702
New York-Chicago	53,012
Chicago-San Francisco	56,654
New York-Atlanta	8,566
Buffalo-Cleveland	1,272
Dallas-Galveston	1,980
Dallas-San Antonio	2,689
Atlanta-New Orleans	3,143
Chicago-Cincinnati	2,575
Total	199,284

Aviation is Used as Text in All Classes Of the Western College of Aeronautics

TECHNICAL DISCUSSIONS of aviation problems, as outlined by aeronautical authorities in AVIATION, is considered so comprehensive by the Western College of Aeronautics, Los Angeles, that it states it has adopted this magazine as the text on contemporaneous aeronautical engineering in all classes.

Not only is the magazine used in connection with the classes at the school but in answering inquiries relative to home study courses it has been the practice of the Western College authorities to recommend that the prospective student purchase the book "Modern Aircraft" by Page and subscribe to AVIATION. The Western College of Aeronautics does not conduct a home study course and feels that the student may accomplish as much by a diligent study of the texts mentioned as by the work involved in connection with the ordinary home study course in aviation.

Over 3,000 inquiries have come to the College for home study course and all have been advised to follow the course outlined.

Cardinal Fliers of Louisville, Ky., Named Agent for Fairchild and Waco Airplanes

NEWLY INCORPORATED at Louisville, Ky., the Cardinal Fliers organization has become Fairchild and Waco plane agent.

Much other activity is reported from Louisville. The city has passed a bond issue of $750,000 to purchase Bowman Field for use as a municipal airport. Furthermore, the Aero Club of Kentucky, with headquarters at Louisville, announces the establishment of a landing field at Tompkinsville, Ky., and arrangements for another at Mammoth Cave.

New Riggs Airplane Co., Bartlesville, Okla., To Manufacture Planes for Oil Field Work

A THIRD airplane company has been organized in Oklahoma to manufacture a plane suited for work in the Oklahoma and other oil fields. This company is known as the Parker-Riggs Airplane Co. and is to be located at Bartlesville, Okla. The other two companies are the Coffman Monoplane Co. at Clinton and the Spartan Aircraft Co. at Tulsa.

Billy Parker, aviator with the Phillips Petroleum Co., and A. B. Riggs, airplane designer and engineer, are to be the heads of the new company.

The charter for the new company has been issued and hangars and factory are now nearing completion at Bartlesville. The factory is located at the Phillips Petroleum Co.'s airport, west of the city, the executives of the company being the new owners.

Work on the factory is expected to be finished by July 30. No details as to the plane, designed by Riggs, have been released except that it is claimed to be sturdier and better fitted for the oil field work. It will be a monoplane.

Data Released on the Napier Lion Engine Used in Plane Which Won Schneider Race

THE BRITISH Air Ministry recently released data on the Napier Lion racing engine used in the Supermarine seaplane which won the Schneider Trophy at Venice, Italy, last year, breaking the world's speed record at that time.

The engine is a 12 cylinder W type water cooled design, developing 875 hp. at 3300 r.p.m. It weighs 930 lb. or 1.063 lb. per b.hp. It operates with a compression ratio of 10 to 1, using fuel with high benzol content and 44 per cent. tetra ethyl lead. The engine head is of very clean design, with the cylinder heads and valve housing of streamline shape so that no cowling is necessary. The drag of the engine was increased by the addition of a protection gear having a ratio of 1.308 to 1. It is stated that the fuel consumption is close to 50 gal. an hour.

Air Cop

Thomas M. Hurlburt, sheriff of Multnomah County, Ore., commissioning Gordon Mounce as an aerial deputy sheriff. Mounce has three planes at his command ready to hunt law breakers.

Zeebrugge Company of Brussels, Belgium, Constructs All Metal Observation Plane

The Zeebrugge Aeronautical Construction Co. of Brussels, Belgium, has completed an all metal biplane for observation purposes. Powered with a 500 hp. Hispano-Suiza engine, "Z.A.C.C.O." A-2 is stated to have a high speed of 150 m.p.h. and a landing speed of 42 m.p.h. The plane is a single bay biplane of all metal construction using duralumin both for internal structure and for covering. The covering is of sheet metal riveted in place.

The upper wing is at a dihedral of 4 deg. while the lower wing has none. The wings are braced with tie rods in the usual manner. Landing lights are mounted below the lower

The "Z.A.C.C.O." all metal biplane that has a high speed of 150 m.p.h.

wing to provide for night flying. The rear cockpit is fitted with two machine guns firing forward and one firing to the rear, with an additional gun for tracer bullets. Cameras for photography and radio telegraph apparatus have been installed. In order to compensate for any variation in load, the horizontal stabilizer is adjustable. The gasoline tanks are fitted with dump valves so that they may be emptied almost instantaneously.

The following data has been submitted on the Zacco A-2:

Span	41 ft.
Length overall	28.06 ft.
Height	11.15 ft.
Tread	6.56 ft.
Upper wing, dihedral 4°, area	229.92 sq. ft.
Lower wing, dihedral 0°, area	207.75 sq. ft.
Total area	437.67 sq. ft.
Mean gap	5.25 ft.
Chord	6.1 ft.
Stagger	2.46 ft.
Angle of incidence of wings in ratio to axis of fuselage	3 deg.
Weight empty (with Hispano-Suiza 500 hp. engine) including water	2772 lb.
Useful load	1782 lb.
Total weight	4554 lb.
Climb to 19,680 ft.	38 min.
Ceiling	24,600 ft.
Power loading	9.13 lb./hp.
Wing loading	10.76 lb./sq. ft.
High speed	150 m.p.h.
Landing speed	42 m.p.h.

Thunderbird Aircraft, Inc., Los Angeles, Contracts for Consolidated Instruments

THE CONSOLIDATED Instrument Co. of America, Inc., New York City, has received a contract from the Thunderbird Aircraft, Inc., of Los Angeles, Calif., for complete Consolidated instrument equipment for one year. In addition to other Consolidated products, Thunderbird planes will be equipped with the Consolidated Type A indirect lighted aircraft instrument panel.

Aeronautics Branch, Dept. of Commerce, Issues 16 Experimental Airplane Licenses

THE AERONAUTICS Branch of the Department of Commerce has issued experimental airplane licenses to the following:

National Airways System, Lomax, Ill., for a trans-Pacific land type biplane—Wright Whirlwind engine.

Valentine Gephart, Seattle, Wash., Woodson monoplane—Air-Cat.

Buhl Aircraft Co., Marysville, Mich., Buhl biplane—Whirlwind.

Wallace Aircraft Co., Chicago, Touroplane cabin monoplane—Anzani.

Greys Harbour Airways Co., Aberdeen, Wash., three place semi-cantilever cabin monoplane—Kinner.

Bemer Elisha Albrecht, Anderson, Ind., low wing monoplane—Harley-Davidson engine.

William F. Crawford, Long Beach, Calif., Crawford A 1 LeRhone.

The Simplex Aircraft Corp., Defiance, O., K-2-S—Kinner.

Irish Aircraft Co., Water & Meigs Streets, Sandusky, O., three place high wing monoplane—Curtiss OX-5.

Curtiss Aeroplane & Motor Co., Garden City, N. Y., Curtiss monoplane—OX-5.

Dietz Airplane Co., Dayton, O., three place biplane, Curtiss OX-5.

Orville H. Hickman, Minneapolis, Minn., three place biplane—OX-5.

Federal Aircraft Works, Minneapolis, Minn., three place biplane—Hispano.

Curtiss Aeroplane & Motor Co., Garden City, N. Y., Curtiss three place cabin monoplane—OX5.

North Star Aircraft Corp., St. Cloud, Minn., Liberty Bell biplane—Hispano.

John Henry Mears, New York City, Fairchild FC-2—Wasp.

Twin Cities-Rochester Ford Plane Service Being Inaugurated by Jefferson Company

A DAILY passenger service between the Twin Cities and Rochester, Minn., the well known medical center, is being inaugurated by the Jefferson Highway Transportation Co., bus operators in Minnesota. A Ford tri-engined transport monoplane will be used on the approximately 45 min. run between the terminals. It is the intention to make two flights from the Twin Cities to Rochester each day, and during the stops at the airports between the trips, sightseeing hops will be made over the respective cities. This passenger service is expected to be used extensively by the large number of doctors traveling through the Twin Cities to Rochester from all parts of the country.

Reduction in Aviation Insurance Premium Is Announced by Barber & Baldwin, Inc.

FORTY TO 50 per cent. reduction in the extra premium heretofore added to the regular premium on life policies to cover the flying hazard has been announced by Barber & Baldwin, Inc., aviation insurance underwriters.

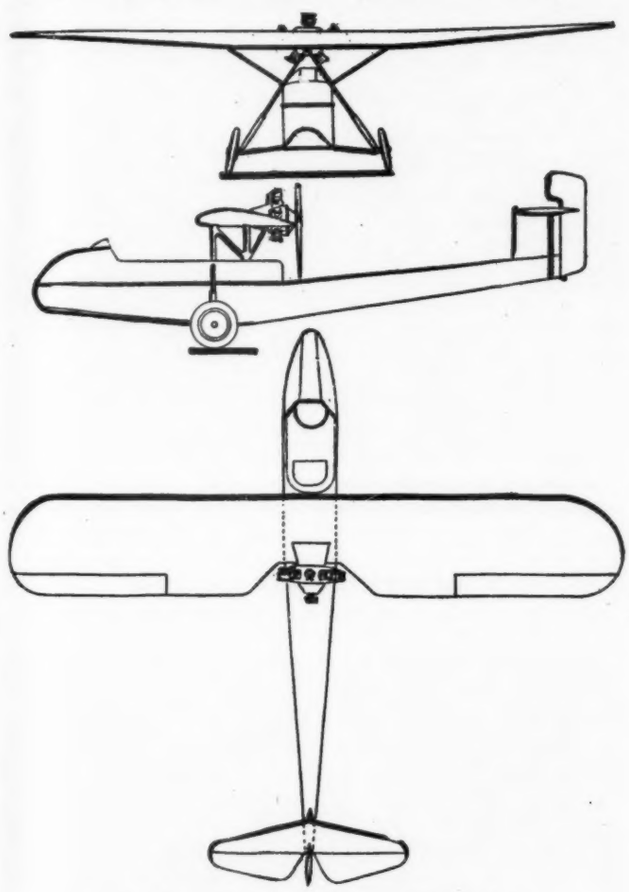
This action was taken after a careful review of the life insurance situation. Heretofore, the premium rate for pilots and passengers on aircraft has been from $10 to $40 per thousand to cover the flying part of the hazard. This charge was added to the regular premium on the policy. This extra premium has now been reduced and will range from five to $25 per thousand.

New Koolhoven F.K. 30 Monoplane Built In the Netherlands is Radical in Design

FREDERICK KOOLHOVEN, Dutch aeronautical engineer, has completed the Koolhoven F.K. 30, a quite radical type of monoplane. It is of pusher design, with the pilot and passenger sitting in front of the wing, the passenger in the rear close to the center of gravity. One of the most interesting features in the F.K. 30 is that instead of having the wing folding, it is built in one piece, arranged to turn round its center and lay fore-and-aft along the fuselage.

The wing is supported by a pair of N struts mounted on a "turn table" fixed to the fuselage behind the cockpit. It is locked in position with a special device.

The fuselage is exceptionally long and is rectangular in section with the lower longerons in the rear portion almost resting on the ground. The fuselage decreases in depth behind the wing to give the proper clearance for the propeller. The vertical fin which supports the stabilizer is built integral with the fuselage. As the fuselage is set very low, the axle of the wheel is almost horizontal, with the shock absorber carried to the upper longeron. Gasoline and oil are carried in the center section in front of the engine.



Three view drawing of Koolhoven monoplane.

The first plane was built using a 60 hp. Armstrong-Siddeley "Genet" engine, with provision for the installation of a 60 hp. Walter, or a 55 hp. Ryan Siemens engine. With this power plant, it is stated to have a high speed of 90 m.p.h. Additional specifications are as follows:

Span	29.5 ft.
Wing area	144.4 sq. ft.
Weight empty	792 lb.
Useful load	660 lb.
Weight loaded	1452 lb.

Traffic Experts to Study Foreign Services As Step in Forming the T.A.T. Air-Rail Line

AS AN initial step toward organizing the Transcontinental Air Transport, Inc., air-rail passenger service between New York and Los Angeles, Pennsylvania Railroad officials announce that two of the railroad's most experienced traffic officers have been sent to Europe for the purpose of making an intensive study of the aviation systems of the Continent and England.

The two officers are Charles H. Mathews, Jr., assistant general traffic manager, whose offices are in Philadelphia, and Maj. C. E. McCullough, general passenger agent, Washington, D. C. Lieut. C. S. (Casey) Jones accompanies them.

Their investigation, P.R.R. officials said, will be devoted particularly to questions of commercial arrangements, including the handling of baggage and problems involving the comfort and convenience of passengers with respect to airports and flying service.

The English airways will be studied first. The party then will fly to Amsterdam and thence to Berlin, where particular attention will be given to the methods and commercial organization of the German air passenger lines. The French system will be studied at Le Bourget, Paris, and elsewhere throughout the country. A visit will be made to the International Exposition of the Aeronautical Industries, which will open in Paris on June 29.

In addition to the trips arranged to the Swedish and Danish airports, the tour will be concluded with a survey of the aviation centers of Switzerland and Italy. It is expected the party will return to the United States early in August.

Many Conferences Arranged

Advance arrangements, which have been made for contacts in the various countries to be visited, include conferences with promoters of passenger flying throughout the Old World. Some of the conferences have been arranged as follows:

In England—Sir Eric Geddes of the Imperial Airways, London; Gen. Sir. Sefton Brancker of the Imperial Airways and the British Air Ministry; Maj. J. S. Buchanan of the British Air Ministry; C. R. Fairey of the Fairey Aviation Co.; A. H. Fedden, managing director, Bristol Manufacturing Co.; and A. V. Roe, president of the A. V. Roe Co., London.

In Holland—A. Plesman, managing director of the Royal Dutch Air Lines, The Hague, and Jonkheer van Heemstede, The Hague. In France—P. A. Flandin, chairman of the Air Transport Committee, International Chamber of Commerce, Paris, and Louis Breguet, president of the Breguet Aviation Co. of Paris. In Germany—M. Wronski, managing director of Luft Hansa, Berlin. In Sweden—Capt. G. F. C. Florman, president of the Swedish Air Lines, Stockholm. In Denmark—Bendt Rom of Copenhagen.

Technical Advice for Users of Acetylene Is Offered by International Association

TECHNICAL ADVICE is offered to the users of acetylene and various kinds of acetylene apparatus by the International Acetylene Assn., 30 East 42 Street, New York. The association has a technical engineering committee to handle any problems submitted regarding the installation, operation, and maintenance of acetylene apparatus. Occasionally new problems come up which require experiment and consultation with engineers who specialize in this subject, and it is stated that such problems will receive careful consideration by the technical engineering committee.

REVIEWS

The book Department, Aviation, 250 West 57th St., New York City can supply all books mentioned except government publications. N.A.C.A. publications may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

German-English English-German Dictionary of Military Terms and Phrases—by Kurt Hilmar Eitzen. Verlag Offene Worte, Berlin. 425 pages.

It is claimed to be the first compilation of aeronautical terms in both German and English. It is meant to be used in the U. S. Infantry and Cavalry school, in the Military Academy at West Point, N. Y., in post schools, etc., and by the officer interpreter. The author was a German trench officer during the World War.

Letters from a Flying Officer—by Rothesay Stuart Wortley. Oxford University Press, American Branch, New York. 206 pages. $2.50.

A very interesting story of the experiences of the author during the World War as a pilot in No. 22 (Bristol Fighter) Squadron in France. It consists of letters and extracts from his diary from August, 1914, when he was a staff captain in the infantry, through the time when he joined the Flying Corps in 1917, up to his death in 1918. In March, 1918, he was awarded the Military Cross. The book was compiled by Duff Cooper and John Buchan. It describes in detail, in a vivid style, the exploits and experiences of the author and his companions and is therefore a history of the Flying Corps in action on the Western Front.

University of Toronto Bulletin No. 7. Aeronautical Papers by J. H. Parkin:

Paper No. 16 includes a description of the new aerodynamic laboratory of the University of Toronto, with data on tests and calibration, a variation on air flow and set up of the balance.

Paper No. 17, entitled "Research on Channel Wall Interference", goes into great detail on that subject and includes photographs, curves, and wind tunnel data.

Papers No. 18 and No. 18a cover an investigation of the pressure distribution over U.S.A. 27 and Gottingen 387 airfoils with square wing tips.

Paper No. 19 is an investigation of biplanes, with data on pressure distribution on nine biplanes of unit gap/chord ratio and varying staggers and various airfoils, namely, Airscrew-4, U.S.A.-27, and Gottingen-387.

Mid-Plane Company Inaugurating a Daily Minneapolis to Fargo Passenger Service

A DAILY passenger service between Minneapolis, Minn., and Fargo, N. D., is being inaugurated by the Mid-Plane Sales & Transit Co. of Minneapolis. Fairchild cabin monoplanes with latest conveniences for the comfort and welfare of the passengers will be used.

One Fairchild will leave each terminal in the morning, returning in the afternoon of the same day, thus making it possible to transact business at each point with the minimum loss of time. Ten minute stops will be made en route at the three Minnesota cities St. Cloud, Alexandria, and Fergus Falls with an elapsed time of about three hours being required for each trip, according to the present schedule. A flat rate of $25 for either one way or round trip flights will be in effect at present, and if the patronage is as good as expected, then additional Fairchilds will be placed in service with reduced rates.

Air Service, Inc., of Minneapolis Offering Summer Aero Course to College Students

AN INTENSIVE ground and flying course restricted to college students is being offered during the summer months by the Air Service, Inc., of Minneapolis, Minn. This training is intended to give the students instruction in ground work, shop practice, and flying in order to prepare them for examination for Government licensed pilots.

As the school is located in the same building as that of the Mohawk Aircraft Corp., manufacturer of the Mohawk Pinto, it is convenient for the students to note the various steps in the production of a plane. In addition, various instruments, old and new production engines, partly uncovered wings and fuselage, and other necessary facilities for instructing the students, are on hand in well-equipped class rooms. Loose leaf texts are used so as to be able to keep pace with the rapid development of the industry. A. P. McCullough is the registrar of the Air Service School.

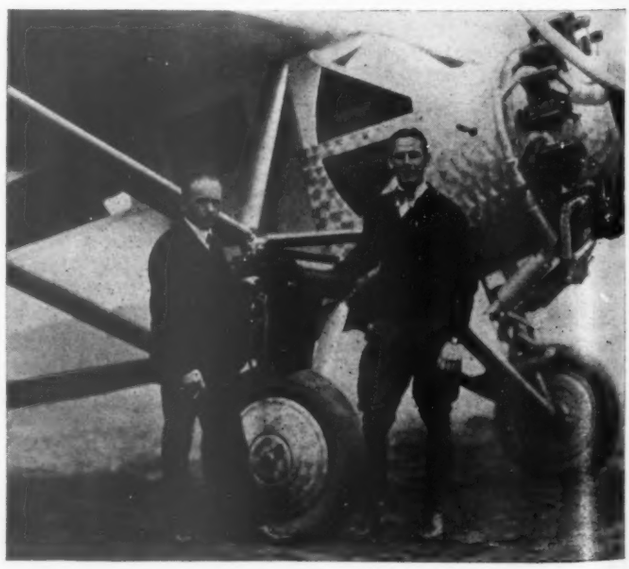
Idaho Sheepman Buys Wacos for Herding And a Ryan Monoplane for Visiting Camps

HERDING SHEEP by airplane, first indulged in by John Brockie of Rupert, Idaho, is becoming more popular as evidenced by the buying of three planes by W. Scott Anderson, another prominent sheepman of Idaho.

Anderson's planes are two Wacos, to be used in an aviation school, taxi service, and aerial reconnaissance for feeding grounds, and a Ryan, four passenger monoplane. The latter will be his private plane and in it he will visit his desert sheep camps. These journeys can be made by air in an hour, whereas by wagon or even truck, days are required.

Further use of the airplane in the West's flat stretches is expected as the ranch owners more fully realize the great value of aircraft in their work.

A Sky Camera Grad



Mel S. Kennedy (right) of Fresno, Calif., is said to be the first graduate of a civilian school of aerial photography in the United States. Kennedy, shown here with H. A. Erickson, his instructor, became an aerial photographer, aerial mapper, and pilot in one operation.

Guggenheim Building is Formally Dedicated At Massachusetts Institute of Technology

THE DANIEL Guggenheim Aeronautical Engineering Building was formally dedicated on June 4 by the Massachusetts Institute of Technology in Cambridge. Dr. Samuel W. Stratton, president of M.I.T., presided. He traced the development of aviation teaching at the Institute from 1910 to the present day and after thanking the Guggenheim Foundation on behalf of the Corporation of M.I.T. introduced Harry F. Guggenheim. He told of a recent survey of aircraft manufacturing establishments which showed a present and greatly increasing future need of skilled aeronautical engineers, sketched the work of the Foundation, and spoke of the place of the new laboratory in the aeronautical future of M.I.T.

Dr. James Howerd Means presented to Samuel Neidelman, 1928, the James Means Memorial Medal for his essay "Intercommunication Between Aircraft and the Ground", which won the annual undergraduate competition for the medal.

A group of celebrated aeronautical engineers and educators gathered at the formal dedication of the Guggenheim Aeronautical Building at M.I.T.. In the front row (left to right) are: Rear Adml Philip Andrews, Boston Navy Yard commandant; A. Lawrence Lowell, president of Harvard; Samuel W. Stratton, president of M.I.T.; Harry Guggenheim, Guggenheim Foundation president; and Edward P. Warner, Secretary of the Navy for Aeronautics.

Assistant Secretary of the Navy Edward P. Warner who flew to Boston to participate in the exercises and who is the head of the Aeronautical Engineering Department of M.I.T. on a leave status with the Navy, declared that aeronautical instruction is relatively without the burdening traditions of teaching in other professions and consequently is vastly more flexible and changes constantly with the advancement of the science of aviation. He declared the aviation instructor who follows a handbook and lectures year after year from a text book or old notes has no place in the profession.

About 400 persons attended the dedicatory exercises at M.I.T. which were held in the auditorium on the third floor. Interesting historical exhibits had been arranged in the various halls and rooms of the laboratory and the apparatus, wind tunnels, library, museum, rigging room, and many special laboratories were open for the inspection of the guests.

New Departure Company Issues Catalogue Giving Data on Various Types of Bearings

A NEW catalogue has been published by the New Departure Mfg. Co. of Bristol, Conn., giving the dimensions, load ratings, price list, and telegraphic code for the various types of bearings manufactured by that company. These bearings are being used on a number of engines and the New Departure Mfg. Co. is expanding its production facilities. It will be recalled that during the war New Departure bearings were used extensively on the Liberty engine.

Paul Braniff Air Transportation Taxi Co. Of Oklahoma to Operate State Air Lines

INCORPORATION PAPERS have been taken out in the State of Oklahoma for the organization of the Paul Braniff Air Transportation Taxi Co.

F. C. Hall and Powell Briscoe of Chickasha, E. E. Westervelt, Southwestern Bell Telephone Co., Ray H. Smiser, Smiser Construction Co.; W. A. Lybrand of Snyder, Owen and Lybrand, attorneys; T. E. Braniff of the Braniff Investment Co., and Paul Braniff are the incorporators of the new firm.

The company at present owns a Stinson-Detroiter, a Ryan Brougham, and two new Travel Air planes. Construction work has been started on a 14 plane hangar at the Oklahoma City field. This hangar besides accommodating the planes will also have pilots' rooms, lockers, rest rooms for women and men, and a passenger waiting room.

The first line of the company is to be an Oklahoma City-Tulsa air line, which is to be opened this month and on which a regular schedule is to be maintained. The company furthermore has set up and will maintain flying schools at Tulsa, Chickasha, and Oklahoma City.

The officers elected recently were: Paul Braniff, president; Lybrand, secretary; T. C. Hall, vice president, and Westervelt, treasurer.

This is the second large airplane company to form at Oklahoma City within two weeks, the Oklahoma Air Transport Co. having a week previously announced their plans for establishing a 12 plane hangar with a state-wide air service at Oklahoma City.

Four Civil Aeronautic Bulletins are Issued By Department of Commerce Aero Branch

ISSUANCE OF four civil aeronautics bulletins is announced by the Aeronautics Branch, Department of Commerce. All may be obtained from the Aeronautics Branch at Washington and are as follows:

Aeronautical Bulletin No. 3 (formerly Information Bulletin No. 3).—Aeronautics Trade Directory. Part 1, Commodities; Part 2, Activities.

Aeronautics Bulletin No. 1 (formerly Information Bulletin No. 1).—Civil Aeronautics in the United States, Part 1, Development; Part 2, Department of Commerce Aeronautics.

Information Bulletin No. 21 (second edition).—Airports, types of management, rentals, concessions, field rules.

Information Bulletin No. 36.—Airport rating regulations, effective May 1, 1928.

American Air Transport to Conduct Air Passenger and Freight Service in Texas

THE AMERICAN Air Transport Co. has opened general offices in the Adolphus Hotel Bldg., Dallas, Tex., to conduct an air passenger, freight, and express line from Dallas to Fort Worth, Wichita Falls, Amarillo, Plainview, Lubbock, Midland, San Angelo, Abilene, and back to Fort Worth and Dallas.

This company will use the latest type of enclosed passenger planes and operate on regular schedule between these towns of North and West Texas, which are prominent centers for the oil, cattle, and agricultural districts. Their air taxi service will extend to any place a person or party wishes to fly.

Air Meet and Exhibit Will Feature Lowell, Mass., Airport Dedication June 21, 22, 23

IN WHAT its sponsors declare will be New England's most pretentious aeronautical undertaking, the Lowell Airport at Lowell, Mass., will be formally dedicated on June 21, 22, and 23 with a combined air meet and aircraft and industrial exposition. The management of the meet and exposition is under the direction of the American Airports Corp. of New York acting as agents for the Lowell Airport Corp., of which Joseph A. Legare is president and Gen. Butler Ames treasurer.

The exposition will be held in four large buildings at the field. The building holding the aircraft section is 400 ft. long and contains 36,000 sq. ft. of space. No charge is being made in the aviation section for space for aircraft or aircraft accessory display, the only cost to the exhibitor being for booth and signs, for which the rate is $.35 per square ft. Inquiries for space and entries in meet events are to be sent to the American Airports Corp. at the U. S. Cartridge Co. Building, 685 Lawrence St., Lowell, Mass.

The Boston & Maine Railroad has a spur running directly to the exposition building at the airport, and all exhibits routed on this line will be delivered without cartage charge at the building.

General admission to the meet and exposition is $.50, while reserved seats are listed at $.50 and $1. The Boston & Maine Railroad, which has an aviation committee, will run excursions to the show at single fare for the round trip from many points on its lines. On each day, the air meet and exposition will open at 10 A.M. and close at 10:30 P.M.

Many Organizations Cooperating

Aviation organizations and committees cooperating are as follows: National Aeronautic Association, Boston chapter, Aviation Committee of the Boston Chamber of Commerce, Aero Club of Massachusetts, Aviation Conference Committee of the New England Council, Air Corps Reserve Officers of New England, Aviation Committee of the American Legion, Department of Massachusetts, and the Aviation Committee of the Boston & Maine Railroad.

Cooperation has also been pledged by the Government War, Navy, and Commerce Departments. The War and Navy Department will enter a number of planes in the air meet and will also have displays in the exposition, and authorization has been given for a visit of the dirigible Los Angeles at the airport dedication.

The Lowell Chamber of Commerce is preparing an exhibit to show the advantageous opportunities Lowell offers to aircraft and other manufacturers. The entire Lowell exhibit in the various buildings will occupy 30,000 sq. ft. of space.

The Lowell Airport is but five minutes' ride by auto from the city hall. The South Lowell Station of the Boston & Maine line is at the northern entrance to the airport, while the Concord Station is at the western end.

Cabin Planes to Meet in Special Rogers Cup Race at Lowell Airport Dedication

TO ENCOURAGE the development of aircraft from the standpoint of reducing aerodynamic resistance, a special commercial airplane race for the Rogers Cup will be held during the dedication of Lowell Airport, Lowell, Mass., on June 21, 22, and 23. The trophy and an additional prize has been donated by Congresswoman Edith Nourse Rogers, who plans to present such an award each year.

Closed cabin planes, each powered with the Whirlwind engine and bearing the same load in fuel and passengers or weight, are to compete in this year's event—a race for the fastest time over a closed course of 45 mi. With horsepower and loads equalized, it is pointed out that the winning plane will be outstanding as a craft of clean design and of least parasitic resistance.

First Annual Seaplane and Motor Boat Race to be Held at Rye, N. Y., July 11-12

AT PLAYLAND, Rye, N. Y., the First Annual Seaplane and Motor Boat Race Meet will be held on July 11 and 12. One of the largest gatherings of privately owned seaplanes is expected at the event by Fitz-William Dalrymple and George W. Sutton, Jr., chairmen, respectively, of the general committees in charge of the two sports represented in the competition. On each day of the meet, racing will start at 1 P.M. and continue until nightfall.

Among the entries received to date for the aviation contests are many well known men and planes. Jack Tweed, former naval aviator and now owner of the New Haven Air Terminal and Joe Kane of the City Island Airways have entered Seagull planes in the race of this class. Harry Rogers of Rogers Airway, Port Washington, has also entered several Seagulls. All Seagulls for this race will be powered with the 150 hp. Curtiss C-B engines.

Ireland Neptune Entered

G. Seymour has entered his Neptune Amphibian from Curtiss Field and this outfit is regarded as a dark horse as this type has never before competed in a race. The Neptune is powered with a Wright Whirlwind.

The Atlantic Airways of New York and Rye have entered an Aeromarine Model 50 flying boat powered with a Hisso 180 hp. engine. Another entry is an Alexander Eaglerock seaplane powered with a new 175 hp. air cooled engine not as yet introduced to the public.

Only planes regularly licensed by the Department of Commerce are eligible for the race meet at Rye. All pilots must also have the annual sporting license of Federation International Aeronautique, the governing body throughout the world for aviation contests. Any official records made during the Rye races will receive international recognition automatically. The racing will be under the sanction of the National Aeronautic Association.

The Aerial Program

The aerial program for the two days according to sequence of events is as follows:

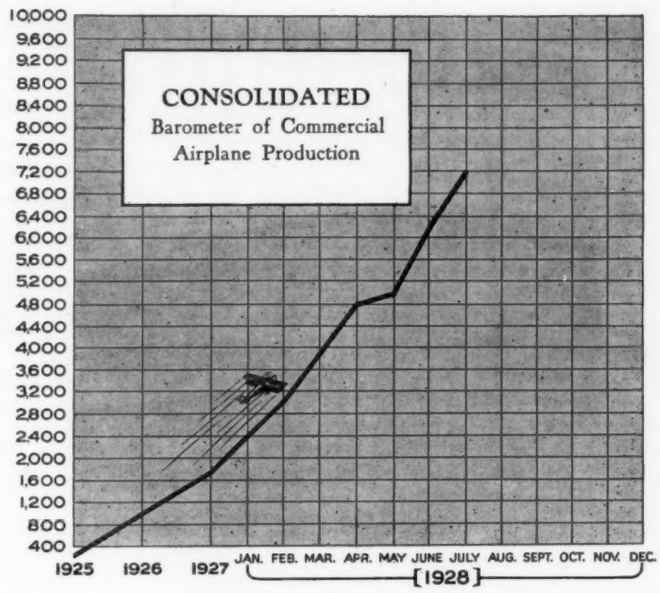
Wednesday, July 11, 1 P.M. Civilian Day

1. Grand assembly of planes.
3. Free-for-all seaplane race up to 100 hp.
5. Dead stick landing contest.
8. Seaplane race up to 200 hp.
10. Free-for-all commercial seaplanes.
11. Parachute jump (woman).
14. Seagull races.

Thursday, July 12, 1 P.M., Service Day

1. Grand assembly of planes.
3. Match seaplane race for Admiral Josephthal Trophy.
5. Formation and combat flying.
7. Dead stick landing contest.
10. Handicap race for service planes.
12. Relay air race, service planes.
14. Parachute jump (woman).
16. Seaplane race for woman pilots.
17. Visit of dirigible Los Angeles from Lakehurst, N. J., base.

THE accompanying chart visualizes the constant growth of airplane production . . . and the present approximate rate of manufacture (planes per 12-month period) . . . as indicated by the current delivery schedule of Consolidated Instruments.



Consolidated Instrument Panel Standard on CURTISS "ROBIN"

TYPE F Star Pathfinder compass, flush mounting, with easily accessible compensating unit.

CONSOLIDATED INSTRUMENTS

Altimeters
Tachometers
Oil Pressure Gauges
Compasses
Temperature Gauges
Air Speed Indicators
Instrument Panels
Gasoline Gauges
Fuel Strainers
Inclinometers
Clocks
Navigation Lights
Landing Lights
Dash Lights
Air Pressure Gauge

CONSOLIDATED aircraft instrument panel Type A; dependable instruments effectively grouped in indirect illumination.

THE "Robin", Curtiss' initial venture in quantity production of commercial airplanes, is equipped with the Consolidated Type A Aircraft Instrument Panel. In standardizing on this attractive, indirectly illuminated unit, Curtiss has provided up-to-the-minute advantages for those who will fly these graceful, flashing ships.

More and more, leading aircraft manufacturers are adopting this recently developed Consolidated Panel as the most convenient and efficient instrument equipment for their planes.

One or more Consolidated Instruments is standard equipment on most American commercial airplanes.

CONSOLIDATED Instrument Company of America, Inc.

41 East 42nd St., New York

Western Representative

M. E. Hulse, 5391 Broadway, Oakland, Calif.

Unofficial Entry List for National Air Tour Indicates Score of Airlanes Will Compete

ALTHOUGH TWO planes, a Bellanca entered by Edward F. Schlee, and a tri-engined Ford, entered by the Texas Oil Co., comprise the total craft officially entered in the National Air Tour at this writing, Karl S. Betts, assistant manager of the aircraft events committee, Detroit Board of Commerce, announces word has been received from manufacturers promising at least 18 more planes. The Tour leaves Ford Airport, Detroit, June 30.

The unofficial list, Betts said, includes three Ryans, three Stinsons, two Fords, two Lockheeds, one Kreider-Reisner Challenger, Model C-3, with Fairchild Caminez engine, one Paramount "Cabinaire", one Caminez Travel Air, one Stearman, Model C-2-B, one Buhl, one Swallow, one Spartan, and one International Model F-17 Sportsman.

The Stinson entries will include one of their latest products, the Junior. H. A. Spears, vice president and general salesmanager of the International Aircraft Co., Cincinnati, will pilot the Sportsman.

While the Paramount Aircraft Co. of Saginaw, Mich., has definitely promised to enter one of their four place, Warner engined Cabinaires, they have indicated that they may also enter another plane equipped with a 110 hp. air cooled, Dayton Bear.

Deed Levy probably will pilot the Stearman entry, Betts said. An additional Buhl, the company's former product, the Airster, may be entered by the Reed-Murdock Co. of Chicago. The two additional Fords will probably be entered by the Standard Oil of Indiana and the Ford Motor Co. Both Eddie Stinson and George Haldeman have been named as probable pilots of two of the Stinson entries. The Travel Air Manufacturing Co. has indicated the probability of an additional entry.

As we go to press, 22 cities have been visited by the National Air Tour "pathfinding" plane and have been definitely decided upon as stopping places along this year's tour route.

The tour route up to the present progress of the pathfinding plane is as follows: Leave Ford Airport at 10 A.M. June 30. Indianapolis, June 30, (noon); St. Louis, June 30, July 2; Springfield, Mo., July 2, (noon); Wichita, July 2-3; Tulsa, July 3-5; Fort Worth, July 5-7; Waco, July 7 (noon); San Antonio, July 7-9; Marfa, Tex., July 9, (noon); El Paso, July 9-10; Tucson, July 10-11; Yuma, July 11, (noon); San Diego, July 11-12; Los Angeles, July 12-14; Fresno, July 14, (noon); San Francisco, July 14-16; Corning, Calif., July 16, (noon); Medford, Ore., July 16, (afternoon); Portland, July 16-18; Tacoma, July 18-19; Spokane, July 19-21. Missoula, Mont., will be a noonday stop on July 21, while the tour planes are making the 300 mi. flight from Great Falls, Mont.

The route from Missoula is expected to be through Great Falls, Froid, Minot, Fargo, the Twin Cities, Wausau, Chicago, and Battle Creek, bringing the tour to a conclusion in Detroit, July 28. Helena, Mont., may be made a stop between Missoula and Great Falls. Three cities visited by the pathfinding plane—Oklahoma City, Phoenix, and Oakland—have been eliminated from the route.

Official Elimination Balloon Race Standings Place Captain Kepner First with 261.5 Mi.

FINAL OFFICAL standing of the contestants in the storm-beset National Elimination Balloon Race held from Bettis Field, Pittsburgh, Memorial Day, is announced by the contest committee of the National Aeronautic Association, after a thorough check-up of all data involved.

The distance established by Captain Kepner is the shortest in the history of the National Races which began in 1909. The previous low mark was made in 1914 by R. A. D. Preston, who landed at a point 301 mi. away from St. Louis, the starting point. Standings follow:

Place	Entry	Pilot & Aide	Place of Landing	Distance
1.	Scott Field	Capt. W. E. Kepner Lt. Wm. O. Eareckson	1 mi. N Weems, Va., 2 mi. W. Irvington, Va.	261½ mi.
2.	C. A. Palmer	C. A. Palmer J. W. Mell	4 mi. E. SSE. Cumnor, Va.	248 "
3.	Detroit Balloon Club	W. C. Naylor Russell Wherritt	3 mi. W Widewater, Va.	187½ "
4.	Detroit Balloon Club	G. M. LeGallee W. A. Klikoff	3½ mi. E Connellsville, Pa.	30-4/5 "
5.	NAS Lakehurst, N. J.	Lt. T. G. W. Settle Geo. N. Steelman	1½ mi. S Perryopolis, Pa.	21½ "
6.	Langley Field, Va.	Lt. Paul Evert Lt. U. G. Ent	Foxdale, Pa. 1 mi. S Youngwood, Pa.	18¾ "
7.	Goodyear Tire & Rubber Company	W. T. Van Orman W. W. Morton	Youngwood, Pa. Christy Park	17¼ "
8.	Cleveland Chamber of Commerce	C. K. Wollam J. F. Cooper	Near Youngwood, Pa. W Newton Road	14¼ "
9.	E. J. Hill and A. G. Schlosser	E. J. Hill A. G. Schlosser	3 mi. E Irwin, Pa.	12¼ "
10.	Geo. Hineman	Geo. Hineman E. F. Johnson	6 mi. W Jeannette, Pa. 5 mi. N Irwin, Pa.	11 "
11.	Scott Field	Capt. Edmund Hill Lt. J. G. Fisher	Irwin, Pa.	10 "
12.	Gardner Motor Co. St. Louis, Mo.	H. E. Honeywell Arthur C. Hoskins	3 mi. N Irwin, Pa. on Pa. RR Tracks	8 "
13.	NAS Lakehurst N. J.	Lt. J. H. Stevens Lt. Geo. F. Watson	Pitcairn, Pa.	7¼ "
14.	*Sun Telegraph*	W. G. Bennett Walter Chambers	4 mi. W Trafford City	5¾ "

Le Boutillier, Miss Boll, and Argles Leave New York on First Leg of Atlantic Flight

HOPING TO be the first woman to fly across the Atlantic, Miss Mabel Boll, Oliver Le Boutillier, and Arthur Argles, her pilots, are flying north in the Bellanca monoplane Columbia with Harbor Grace, Newfoundland, as their goal. At this point, 300 gal. of gasoline await them to be taken aboard for the trans-Atlantic attempt which is to follow. The Columbia took off from Roosevelt Field, L. I., at 7:19 A.M. June 12.

Miss Amelia Earhart, also competing for the honor of being the first woman across, is still at Trepassey, Newfoundland, with Wilmer Stultz, her pilot, and Louis Gordon, mechanic, awaiting favorable conditions for a take off in the tri-engined Fokker monoplane Friendship.

The Bellanca Columbia, the monoplane in which Chamberlin and Levine flew from New York to Germany last summer, is reported to be in the best condition for the attempt. The plane is powered with a single Wright Whirlwind engine.

Should weather conditions deter them, the fliers will alight at Old Orchard, Me., rather than Harbor Grace. It is not as yet known from which point the trans-Atlantic flight will begin.

Captain Carranza is Forced Down in North Carolina on Mexico City-Washington Flight

AS WE go to press, Capt. Emilio Carranza, Mexican good will flier attempting a non-stop flight from Mexico City to Washington, D. C., has been forced down by fog at a New York-Atlanta air mail route emergency landing field at Mooresville, N. C. Captain Carranza, returning the courtesy of Lindbergh's flight to Mexico City last December, had been in the air 18 hr. and 35 min., it is calculated, since he left Valbuena Flying Field, Mexico City. He took off on the morning of June 11 and landed at Mooresville shortly before 4 A.M. June 12, having covered 1,745 mi. at an average speed of 100 m.p.h. His fuel load was 326 gal.

Captain Carranza was reported to have held his course well in his Ryan monoplane, the Mexico-Excelsior. He was seen successively over Tampico, Brownsville, Tex., New Orleans, Montgomery, Alabama, and Atlanta.

Receiving his new Ryan plane in San Diego, Captain Carranza immediately flew non-stop to Mexico City on May 24 and 25. The Mexican flier completed this 1,575 mi. flight in 18 hr. 20 min.

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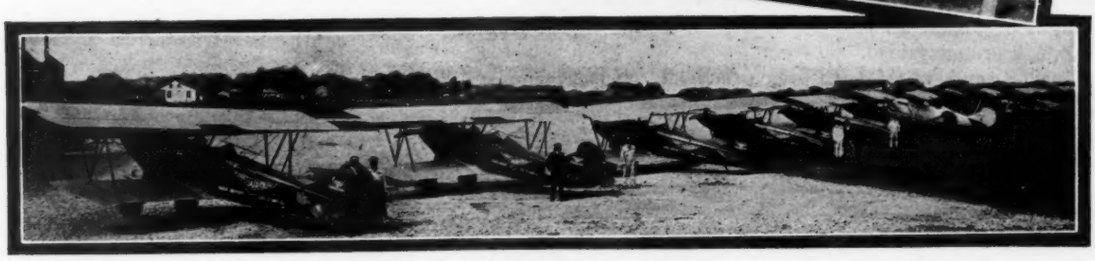

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THANK YOU *for mentioning* AVIATION

Southern Cross Airmen Land at Sydney Completing 7,800 Mi. Trans-Pacific Flight

CAPTAIN KINGSFORD-SMITH, Charles T. P. Ulm, Harry W. Lyon, and James Warner completed their trans-Pacific flight of 7,800 mi. from Oakland, Calif., when they landed in their tri-engined Fokker monoplane Southern Cross at Sydney, Australia, their goal, on Sunday June 10. The fourth and last leg of their great flight was a comparatively short hop of 500 mi. from Brisbane, Australia.

As we go to press, the fliers are preparing for a visit to Melbourne, which lies some 600 mi. from Sydney. At this point, Lyon, navigator, and Warner, radio operator, both Americans, plan to conclude their trip by air. Captain Kingsford-Smith and Charles Ulm, however, report they will continue in the Southern Cross in a journey around the world. After a visit to New Zealand, the Australian fliers plan to fly to Europe by way of India and Egypt, and to continue from there to America in a trans-Atlantic flight.

The four airmen left Oakland, Calif., on May 31 and landed at Wheeler Field, near Honolulu, less than 28 hr. later. The second leg, begun on June 3 from the Barking Sands runway, Kauai, Hawaiian Islands, took the fliers over 3,138 mi. of ocean to Suva in the Fiji Islands, where they landed in the Southern Cross on June 4 after 34 hr. 33 min.—the longest over water flight ever accomplished. Since the International Date Line had been crossed en route, it was June 5 in the Fijis when they arrived, a day thus being lost.

Following a day's delay in obtaining a fuel supply from the steamer *Pioneer*, the four took off from Suva and flew to Naselai Beach, 16 mi. distant, from which they were to take off for the 1,762 mi. flight to Brisbane. On June 8 everything was in readiness, and with 880 gal. of gasoline and 32 gal. of oil, the Southern Cross easily lifted from the fine three mile sand runway of Naselai Beach and was on its way to Australia. The flight began at 2:52 P.M. Suva time.

What were reported as the worst flying conditions thus far encountered were met by the airmen between Naselai and Brisbane. There were times during this trip that the Southern Cross dropped 400 ft. as it fought its way through the storms. The monoplane, however, proved superior to these conditions; each time it was successfully brought out of its falls.

The flight steadily continued despite the gales, and finally land was sighted near Ballina, 150 mi. south of Brisbane. This position indicated how the Southern Cross had been thrown from its course. From Ballina, the fliers rode into Brisbane, arriving on June 9 at 10:10 A.M. Brisbane time after a flight of 21 hr. 18 min. in which an average speed of 82 m.p.h. was maintained.

A landing en route would have been practically an impossibility, for only the island of New Caledonia, a mountainous stretch of land, lay directly in their route. To the northward lay the Loyalty Isles, but these are but small coral rings.

Boeing Line to Extend New York-Chicago Night Air Mail Service to Lincoln, Neb.

EXTENSION OF the New York-Chicago overnight air mail service from Eastern points westward to Lincoln, Neb., over the Boeing Air Transport transcontinental route will go into effect on July 10, according to a statement issued at San Francisco by W. G. Herron, vice president in charge of traffic.

The purpose of the Post Office Department in establishing the service, Horton said, is to give adequate overnight air mail connection from New York City to Cedar Rapids, Des Moines, Omaha, and Lincoln. West-bound planes will leave Chicago at 5:45 A.M. immediately after arrival of National Air Transport plane from New York. It will arrive at Cedar Rapids at 8:00 A.M.; Des Moines at 9:00 A.M.; Omaha at 10:15 A.M.; and Lincoln at 10:45 A.M. Eastbound planes will leave Lincoln at 2:45 P.M.; Omaha at 3:15 P.M.; Des Moines at 4:30 P.M.; Cedar Rapids at 5:30 P.M. and Chicago at 7:30 P.M. The night plane leaves Chicago for New York at 8:00 P.M.

The new service will operate eastbound daily except Saturday and Sunday, holidays, and days preceding holidays. Westbound planes will fly daily, except Sunday and Monday, holidays, and days following holidays. Omaha, Des Moines, and Chicago, the eastern terminus of the Boeing Air Transport route, will retain the same arrivals and departures of transcontinental planes in operation since July 1 last year.

In addition to air mail, air express will be carried under contract with the American Railway Express Co. under the same plan in effect on all major air lines. The regular passenger service offered by Boeing Air Transport will be extended to the new route. The schedule will be especially convenient to Chicago business men, who can leave the city by plane at 5:45 A.M., spend from four to nine hours in points on the route and be back in Chicago by 7:30 P.M., according to the statement.

Boeing planes now flying on the Boeing Air Transport route will be used on the new service until additional planes can be turned out by the Boeing Airplane Co.'s factory at Seattle. The new planes will seat four passengers in a comfortable cabin, and mail and express will be carried in a forward compartment. Power equipment will be the Pratt & Whitney Wasp and Hornet engines.

Chicago-Atlanta, Ga., Air Mail Line Bids Are Invited by Post Office Department

AN ADVERTISEMENT has been issued inviting proposals for the transportation of air mail under contract from Chicago, Ill., via designated points, to Atlanta, Ga., and return, distance over all each way being approximately 790 mi.

The route is open to bidders regardless of residence, and bids will be received at the Department in Washington until 12 o'clock noon, June 30, 1928. Copies of the advertisement are on display at all post offices on the route, and the instructions to bidders contained therein are uniform.

Attention is directed to the fact that at the present outlined schedule on this route involves night flying and that as the route may have to be lighted by the Department of Commerce, it may be several months after award of contract before contractor can begin performance of service.

The schedule to be adopted will require an average flying speed of at least 90 m.p.h. The Department realizes that in some instances, due to weather conditions, etc., it may be impracticable to maintain such an average, but under favorable conditions even better time may be possible. Proper allowance will be made in all such cases. Prospective bidders are notified that the Department will not permit the continuance in the air mail service of types of planes which while rated at 90 m.p.h. or more cruising speed do not attain such speed in actual daily operation at normal r.p.m.

The bond to be furnished with the proposal is in the amount of $15,000. Cashier's or certified checks are not acceptable as a bond. An additional bond of $1,000 will be required when the contract is signed.

Contractors must permit planes of other contractors on connecting lines to land and take-off at all fields on this route when such planes are actually engaged in transporting mails to or from this route. Proposal blanks may be obtained from postmasters on the route or from the office of the second assistant postmaster general.

AVIATION offers another service to its readers

Books on aviation regardless of where published may be obtained through AVIATION'S book department.

THE following books* were chosen in an effort to compile a concise list of the best of modern aeronautical publications:

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AERODYNAMICS AND AIRPLANE DESIGN. By Edward P. Warner (598 pages) .....$ 7.50
Text on aerodynamics and its applications to airplane design, divided into three parts; airfoils and airfoil combinations, performance calculations, maneuverability and stability. 1927 (advanced student).

APPLIED AERODYNAMICS. By Leonard Bairstow (565 pages) $12.00
Theoretical and practical aerodynamics as applied to airplane design. 1920 (advanced).

ANNUALS

AIRCRAFT YEAR BOOK (551 pages) .$ 5.25
Published by the Aeronautical Chamber of Commerce. Records the events, records, airplanes, and data on aircraft manufacturers for 1927. Back issue obtainable.

AMERICAN AIRCRAFT DIRECTORY
(176 pages) .....$ 3.00
Cloth .....$ 5.00
Directory of the aircraft industry by states and cities. Lists personnel of the various government bureaus, educational institutions, etc., data on aviation competitions and meets, landing fields and seaplane anchorages. 1928. Revisions published periodically.

JANE'S ALL THE WORLD AIRCRAFT
(534 pages) $12.75
Descriptions, photographs, and drawings of airplanes, engines, balloons and airships. 1927.

WHO'S WHO IN AMERICAN AERONAUTICS (200 pages, approximately).$ 1.25
Names and past activities of everyone connected with the aeronautical industry. 1928.

BALLOONS AND AIRSHIPS

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Properties of the atmosphere and airship gases and their effects on free lighter-than-air craft. 1926 (advanced).

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DESIGN AND CONSTRUCTION

AIRPLANE DESIGN AND CONSTRUCTION. By Otterine Pomilio (404 pages) .....$ 5.00
Design and construction of the airplane, performance calculations, and stress analysis. 1919 (advanced).

AIRPLANE STRUCTURES. By Alfred J. Pippard and Laurence J. Pritchard (359 pages) .....$ 7.50
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Handbook on construction, maintenance and repair of aircraft engines, engine accessories and instruments. 1928.

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Heat engines explained and compared, with practical notes on operating features. Design and construction of propellers, water ballast recovery. 1926 (advanced student).

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Theoretical and practical design of aircraft engines. 1922 (advanced).

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Descriptions, photographs, and drawings of aircraft engines up to 1921.

TESTING OF HIGH SPEED AND INTERNAL COMBUSTION ENGINES. By Arthur W. Judge (392 pages) ...$ 7.50
Engine tests, apparatus, methods, and analysis of results with special reference to aircraft engines. 1924 (advanced).

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MANUFACTURERS' SPECIFICATIONS ON AMERICAN COM

THE TABLE BELOW IS BELIEVED TO BE ACCURATE BUT A

This table will appear

MANUFACTURER	Designation	Price of Plane at Factory	Type	No. of Seats	Make of Engine	Total Rated HP.	Make of Propeller	Span	Wing Area (Sq. Ft.)	Length Overall	Height Overall	Weight Empty (Lb.) With Water If Water Cooled Engine Is Used	Pay Load (Lb.)	Disposable Load (Lb.)
Advance Aircraft Co.	Waco 10	$2035*	OBL	3	R89	125	.....	30' 8"	272	23' 3"	9' 5"	....	....	....
Advance Aircraft Co.	Waco 10	$2035*	OBL	3	OX5	90	H, Hs	30' 8"	272	23' 3"	9' 5"	1200	760	835
Aero-Craft Mfg. Co.	Aero-Coupe	.....	SBL	3	W	110	.....	32'	250	24'	8" 6'	1100	550	1003
Alexander Aircraft Corp.	Eaglerock	$2,250*	OBL	3	OX5	90	.....	36' 8"	330	24' 11"	9' 11"	....	....	....
Alexander Aircraft Corp.	Eaglerock	$2,250*	OBL	3	R89	125	.....	36' 8"	330	24' 11"	9' 11"	....	....	....
American Eagle Aircraft Co.	.....	$2885	OBL	3	OX5	90	H, Hs	30'	300	24' 6"	8' 4"	1227	840	830
Arkansas Aircraft Corp.	Comm'd-Aire	$3,250	OBL	3	OX5	90	.....	31' 6"	300	24' 6"	8'	1275	....	800
Arkansas Aircraft Corp.	Heinkel H.D. 40	.....	CBL	2	PWw	400	.....	57'	250	39'	14'	....	2500	....
Atlantic Aircraft Corp.	F-7 & C-2	$44,500	CML	10-12	3-J5	600	H	63' 3"	630	49' 2"	12' 9"	5480	2000	3720
Atlantic Aircraft Corp.	Universal	$14,200	CML	5-7	J-5	200	H, Hs	47' 9"	341	33'	8' 9"	2100	1200	1900
Atlantic Aircraft Corp.	Super-Univ	$19,340	CML	6-8	P Ww	400	SS	50' 6"	382	36"	8' 11"	2800	1230	2200
Atlantic Aircraft Corp.	Fokker F-10	$80,000	CML	14	3-PWw	600	SS	71' 2"	728	50' 8"	13' 5"	7200	2340	4950
Arrow Aircraft Corp.	Arrow-Sport	$2,257	OBL	2	LB	60	.....	25' 6"	178	19' 2"	6' 11"	524	....	450
Bach Aircraft Co.	Air Yacht	$31,800	CML	10-12	2-RSg-pww	650	2 Sty, SS	52'	412	36.1	9' 6"	3300	....	3300
Bellanca Aircraft Corp.	CH	$14,500	CML	6	J5	200	Hs	46' 1"	273	24' 9"	8' 6	1850	1100	1560
Berliner Aircraft Co.	.....	.....	OML	3	J5	200	SS	34'	206	25'	8'	1400	....	....
Bird Wing Commr. Airplane Co.	No. 6	$2,795	OBL	3	OX5	90	Hs	31' 4"	303	23' 6"	8' 7	1236	550	1019
Boeing Airplane Co.	40A	.....	SBL	1-5	P Ww	400	H, M	44' 2"	545	34' 3"	11' 7"	3031	1600	3440
Boeing Airplane Co.	B-1D	$15,000	CBF	4	J5	200	.....	39' 8"	466	30' 9"	12'	2442	720	1000
Breese Aircraft Co.	.....	.....	CML	6	J5	200	SS	41'	260	..	10' 6"	155	...	1060
Brown-Mercury Aircraft Corp.	C-3	$9,800	CML	3	3-A6	180	Sty	41' 6"	260	25'	.....	1450	600	1500
Buhl Aircraft Co.	Airsedan-C5A	$12,500	CBL	5	J5	200	SS	42'	320	28	14'	2072	1000	1438
Buhl Aircraft Co.	Airster	$10,000	OBL	3	J5	200	SS	35' 8"	309	23' 2"	9' 7"	1575	800	1380
Cessna Aircraft Co.	3-120	3,575*	CML	3	A	120	H Hs	40' 6"	224	23' 8	7 4	1250	480	750
Cessna Aircraft Co.	4-125	4,075*	CML	4	R89	125	H, Hs	40' 6"	224	23' 8	7 4	1260	760	1030
Cessna Aircraft Co.	4-200	4,475*	CML	4	J5	200	H Hs	40' 6"	224	23' 8	7 4'	1350	800	1070
Crawford M. & A. Mfg. Co.	A1	$1,500	OML	2	LR	80	own	30'	150	17' 9"	8'	950	....	450
Curtiss-Robertson A'p'ne Mfg. Co.	Robin	.....	CML	3	OX5	90	CR	41'	265	25' 9"	7' 10"	1400	....	700
Driggs Aircraft Corp.	Dart II	$1,750	OBL	2	A3	35	Hs	28'	140	19' 6"	6'	380	....	400
G. Elias & Bros.	M-1	$7,500	OBL	1	L12	400	CR	40'	497	28'	12	2857	1200	2016
G. Elias & Bros.	Airmobile	$7,500	OBL	3	L12	400	CR	40'	435	28'	11' 3"	2759	420	1290
Fairchild Airplane Mfg. Co.	FC-2W	.....	CML	5	P Ww	400	SS	50'	332	30' 11"	9'	2570	970	830
Fairchild Airplane Mfg. Co.	FC-2W sea	.....	CMW	5	P Ww	400	SS	50'	332	33' 4"	12'	2418	1130	2182
Fairchild Airplane Mfg. Co.	FC-2 land	.....	CML	5	J5	200	CR	44'	290	30' 11"	9'	2150	845	1456
Fairchild Airplane Mfg. Co.	FC-2 sea	.....	CMW	5	J5	200	CR	44'	290	32' 5"	11' 5"	2427	833	1573
Federal Aircraft Corp.	CM-1	$12,500	CM	5	J4B	200	We	37' 6"	262	29' 3"	9'	2080	630	1205
Gillis Aircraft Corp.	Crusader	.....	CBL	4	R89	125	Hm	32' 9	245	23'	9'	....	....	....
Hamilton Metalplane Co.	H-19	.....	CML	6	J5	200	H	48'	287	32' 7"	8' 10"	1960	....	2000
Hamilton Metalplane Co.	H-21	.....	CML	8	PWw	400	H	54'	392	33' 7"	9'	2685	....	2205
Heath Airplane Co.	Parasol	$695	OML	1	H	23	own	23'	94	16' 9"	5' 11"	290	....	235
International Aircraft Corp.	F-17	$2,750*	OBL	3	OX5	90	H	35'	325	25	9' 6"	1300	400	821
International Aircraft Corp.	F-17	$2,900*	OBL	4	J5	200	SS	35'	325	25	.....	1350	400	1230
International Aircraft Corp.	F-18	$2,250*	OBL	7	J5	200	SS	37'	360	27' 6"	10' 6"	1550	1000	1843
Ireland Aircraft, Inc.	Neptune	$14,600	CMA	5	J5	200	CR	40	350	31' 6"	11' 6"	2250	750	1358
Irwin Aircraft Co.	M-T-2	$1,165	OBL	1	179	25	own	20'	105	13' 6"	5' 9"	275	100	300
Keystone Aircraft Corp.	Pronto	.....	OBL	3	J5	200	.....	39' 11"	365	26' 9"	.....	1975	....	1310
Keystone Aircraft Corp.	Pathfinder	.....	CBL	12	3-J5	600	.....	66' 6"	1150	40' 4"	.....	6536	1900	4481
Kinner A. & M. Corp.	Airster	$3,350	OBL	2-3	K5	100	S	28' 6"	236	21' 3"	8' 5"	850	330	700
Kreider-Reisner Aircraft, Inc.	Challenger	.....	OBL	3	OX5	90	Hs, H	30' 1"	296	23' 9"	9' 4"	1189	412	811
E. M. Laird Airplane Co.	Commercial	.....	OBL	3	J5	200	SS	34'	300	23' 6"	9' 3"	1550	800	....
Laird Aircraft Corp.	Whippoorwi	.....	CBL	4	J-5	200	.....	36'	351	27	9	1650	....	1000
Lincoln Aircraft Co.	L'ncln-Page	.....	OBL	3	OX5	90	.....	32'	300	.....	.....	1200	450	1000
Lockheed Aircraft Co.	Vega	.....	CML	5-7	J5	200	SS We	41'	275	27' 5"	8' 6"	1650	1000	1550
Lockheed Aircraft Co.	Air Exp.	.....	CML	5-7	P Ww	400	SS	41'	275	27' 5"	8' 6"	1850	1000	1945
Loening Aeronautical Engr. Corp.	Cabin Amphibian	$26,700	CBA	5-7	PWw	400	SS	45'	504	34' 8"	13' 2"	3400	1200	2000
B.F. Mahoney Aircraft Corp.	Ryan B1	$12,300	CML	5	J5	200	H W	42'	290	27' 5"	9' 10"	1870	800	1430
Metal Aircraft Co.	Flamingo GMT6	.....	CML	6-8	PWw	400	SS	48'	354'	30'	9'	2800	....	2050
Mohawk Aircraft Corp.	Pinto	$2,675	OML	2	V	70	Hs	30' 6"	124	22'	6' 3"	725	....	500
Mono Aircraft Inc.	Monocoupe	$2,375	CML	2	A	60	.....	30'	150	20	6' 3	700	....	475
National Airways System, Inc.	Air King	$2,395	OBL	3	OX5	90	Hs	34' 1"	310	25' 5	9'	1290	....	800
Niles Aircraft Co.	Williams	.....	OML	1	Ss	40	.....	26'	108	18	6'6"	440	....	....
Pheasant Aircraft Co., Inc.	H-10	$2,375	OBL	3	OX5	90	Hs	32' 6"	283	23' 6"	9'	1297	600	785
Pitcairn Aviation, Inc.	Mailwing	$10,000	OBL	1-3	J5	200	SS	33'	252	22' 10"	8' 10"	1612	600	770
Pitcairn Aviation, Inc.	PA-4	.....	OBL	3	OX5	90	Hs	30'	226	21' 10"	8' 7"	1165	....	765
Prudden-San Diego Airplane Co.	T-M-1	.....	CML	7	3-RS9	375	Wd	57'	427	38'	9' 5"	3000	1200	2153
Richmond Airways, Inc.	Sea Hawk	.....	OMF	5	C6	160	.....	46'	317	28'	.....	1700	....	1000
Sikorsky Mfg. Co.	S-36	.....	OBA	8	3 J5	400	.....	72'	668	34'	12'	4600	....	3000
Sikorsky Mfg. Co.	S-37	.....	CBL	18	2P Wh	1000	.....	100'	1049	45' 6"	16' 3"	8000	4060	7000
Simplex Aircraft Corp.	Red Arrow	$3,950	CML	2	K5	100	Sty	33' 4"	148	20' 3"	6' 10"	1000	....	800
Stearman Aircraft Co.	C-2-K	$6,740	OBL	3	R89	125	H, Hs	35'-28'	296	24'	9'	1285	350	985
Stearman Aircraft Co.	C-2-B	$8,730	OBL	3	J5	200	H, CR	35'-28'	296	23	9'	1438	400	963
Stinson Aircraft Corp.	SB-1	$11,000	CBL	5	J5	200	SS	35' 10"	354	28' 10"	10' 3"	1815	....	1465
Stinson Aircraft Corp.	SM-1	$12,500	CML	6	J5	200	SS	45' 10"	292	32'	9'	1970	....	1515
Stinson Aircraft Corp.	Junior	.....	CML	3	W	110	Wd	39' 6"	228	26' 1"	7' 9"	1450	525	1000
Spartan Aircraft Co.	C-3	.....	OBL	3	RS9	125	.....	32'		23' 6"	8' 9"	1140	....	800
Stout Metal Airplane Co.	4 AT	.....	CML	12	3J5	600	SS	74'	785	49' 10"	12' 8"	6200	....	3800
Swallow Airplane Mfg. Co.	Commercial	.....	OBL	3	OX5	90	.....	32'	300	24'	8' 6"	1470	380	730
Texas Aero Corp.	Temple	.....	OML		J5	200	.....	39' 4"	225	25' 10"	8' 3"	....	567	....
Thaden Metal Aircraft Co.	T-1	.....	CML	7	P Ww	400	.....	53	.....	35	11	2900	....	2200
Thunderbird Aircraft, Inc.	.....	.....	OBL		OX5	90	CR	33	300	25' 6"	.....	1300	....	....
Travel Air Mfg. Co.	2000	$2,950	OBL		OX5	90	H, Hs	34' 8"	296	24' 2"	8' 9"	1350	350	750
Travel Air Mfg. Co.	4000	$9,100	OBL	3	J5	90	H	34' 8"	296	23' 6"	8' 9"	1400	600	1000
Travel Air Mfg. Co.	6000	.....	CML	5	J5	200	SS, H	48' 7"	282	30' 6"	9'	2350	1000	1650
Travel Air Mfg. Co.	Canines	.....	OBL	3	FC	135	HH, s	34' 8"	296	24'2"	8'9"	1275	400	975
Travel Air Mfg. Co.	9000	.....	OBL	3	RS9	125	W	34'8"	296	24'2"	8'9"	1250	360	900
Wallace Aircraft Co.	Touroplane	$2,500*	CML	3	A	80	Hs	37'	205	23' 6"	7' 6"	850	320	650
Whites Aircraft	Hum. Bird	$2,150	OBL	3	OX5	90	Hs	33' 1"	318	23' 6"	8' 3"	1050	450	850
Western Airplane Corp.	King Bird	$2,500	OBL	3	OX5	90	Hs	35'	320	25' 4"	9'	1200	600	900
Zenith Aircraft Corp.	Albatross	$35,000	CML	14	3-RS9	375	Sty.	90'	1032	50'	12' 6"	4000	5000	7000

TYPE:

A—Amphibian
B—Biplane
C—Closed
F—Flying boat
L—Landplane
M—Monoplan
O—Open
S—Semi-closed
W—Seaplane

ENGINE: One engine unless stated in talics.

A—Anzani
C6—Curtiss
FC—Fairchild Camines
H—Henderson
I79—Irwin
J5—Wright Whirlwind
K—Kinner
L—Liberty
LB—Blond
LR—LeRh ne
OX5—Curtiss
P Wh—Pratt & Whitney Hornet
P Ww—Pratt & ... ney Wasp
RS—Ryan Siemens
SR—Super Rhone
Ss—Seekely
V—Velie
W—Warner
*—Price without engine

PROPELLER:

CR—Curtiss Reed
H.—Hamilton
Hs—Hartsell
M—Metal
Sty—Story
SS—Standard Steel
W—Wood
We—Westinghouse

L AIRPLANES AND SEAPLANES AS COMPILED BY *AVIATION*

ES NOT ASSUME RESPONSIBILITY FOR THE FIGURES GIVEN

...ns and suggestions are invited.

Performance With Full Load at Sea Level As Supplied by Manufacturers.																		
Cruising Speed in M.P.H.	Landing Speed in M.P.H.	Climb at Sea Level in F. P. M	Climb to 10,000 in Minutes	Service Ceiling in Feet	Fuel Capacity in Gallons	Normal Range in Miles	Normal Fuel Consumption at Cruising Speed Gal. Per Hr.	Fuselage Construction	Wing Construction	Are Wings Wired for Lighting?	Type of Control	Brakes	Type of Shock Absorber	Type of Pontoon Provided for	Additional Cost as Seaplane	Dept. of Commerce Type Certificate Number	Performance Figure Guaranteed?	
..	..	....	....	....	37	....	....	Wl-ST	Wd-F	No	SPD	Ex.	H	EFH	$1,100	26	....	Advance—Waco 10
95	35	750	29	12,000	37	550	7.5	Wl-ST	Wd-F	No	SPD	Ex.	H	EFH	$1,100	13	No.	Advance—Waco 10
..	..	....	....	....	....	....	....	Wl-ST	Wd-F	Yes	SD	....	....	....	....	....	....	Aero-Craft—Coupe
100	..	900	..	....	46	460	....	Wl-ST	Wd-F	....	SCD	....	RC	E	....	7	....	Alexander—Eaglerock
87	34	514	..	10,200	46	435	10.3	Wl-ST	Wd-F	$20	SCD	....	RC	E	....	....	Yes	Alexander—Eaglerock
85	34	830	..	14,780	46	425	10	Wl-ST	Wd-F	No	SPD	Ex.	R	E	$990	17	....	American Eagle
85	30	575	45	12,000	42	425	7.5	Wl-ST	Wd-F	....	S	....	RC	....	....	..	....	Arkansas—Com'd'aire
..	36	..	..	....	..	400	....	Wl-ST	Wd-F	....	DeD	....	....	....	....	..	5% N	Arkansas—Heinkel H.D. 40
..	54	..	..	....	....	....	....	Wl-ST	Wd-F	....	DeD	....	....	....	....	..	....	Atlantic—Fokker F7 & C-2
100	55	720	24	12,500	185	580	32	Wl-ST	Wd-P	Yes	DeCD	Yes	RC	....	....	Apl	....	Atlantic—Fokker Univ.
98	48	500	40	11,500	78	600	12	Wl-ST	Wd-P	Yes	SCD	Yes	RC	Met.	$2450	9	....	Atlantic—Super Univ.
118	42	1000	15	18,000	120	700	20	Wl-ST	Wd-P	Yes	SCD	Yes	RC	Met.	$3110	Apl	5%	Atlantic—Fokker F-10
125	55	1400	10	18,000	286	580	60	Wl-ST	Wd-P	Yes	DeCD	Yes	RC	....	....	....	....	Arrow—Sport
..	36	680	..	15,200	..	..	....	Wl-ST	Wd-F	....	S	....	RC	....	....	..	Yes	Bach—Air Yacht
110	45	1100	12	18,000	170	500	32	Wd-P	Wd-F	Yes	DeCD	S-B	Hy-C	....	....	....	....	Bellanca—CH
110	46	850	..	13,000	85	800	10	Wl-ST	Wd-F	Yes	SCD	....	RC	D	....	....	....	Berliner
110	44	..	..	....	44	450	10	Wl-ST	Wd-F	....	D	Yes	....	....	....	39	....	Bird Wing—No. 6
90	30	460	80	10,000	35	325	9	Wl-ST	Wd-F	Yes	SC PD	Ex.	RC	E	$600	Apl	Yes	Boeing—40A
..	54	770	19	15,000	100	..	....	Wl-ST	Wd-F	Yes	S	Yes	O	....	....	2	....	Boeing—B-1D
..	52	..	..	12,000	40	..	....	Wd	Wd-F	Yes	DeD	....	....	....	....	23	....	Breese
..	43	900	..	15,500	80	550	9.5	Wl-ST	Wd-F	....	....	....	RC	....	....	..	....	Brown-Mercury—C-3
110	40	600	35	14,000	78	650	12	Wl-ST	Wd-F	Yes	SC	Yes	Grs.	No	....	Apl	Yes	Buhl Airsedan
95	50	700	45	13,500	70	..	15	Wl-ST	Wd-F	Yes	SC	Yes	RD	Met.	$2,500	33	....	Buhl Airster
100	45	1150	10	18,000	64	500	12	Wl-ST	Wd-F	Yes	S	Yes	RD	Met.	$2,500	1	Yes	Cessna Aircraft Co.
110	45	1000	..	....	42	400	10	Wl-ST	Wd-PF	Ex.	SPD	Ex.	RC	....	....	Apl	5%	Cessna Aircraft Co.
115	45	1000	..	....	42	400	10	Wl-ST	Wd-PF	Ex.	SPD	Ex.	RC	....	....	Apl	5%	Cessna Aircraft Co.
125	45	1400	..	....	42	400	12	Wl-ST	Wd-PF	Ex.	SPD	Ex.	RC	....	....	Apl	5%	Crawford—A1
64	47	..	..	18,000	40	500	6	ST-Wd	Wd-F	No	D	....	RC	....	....	No	....	Curtiss—Robin
85	40	500	..	11,000	50	785	....	Wl-ST	Wd-F	....	SD	....	RC	....	....	40	....	Driggs—Dart II
75	35	1660	10	15,000	10	225	....	Wl-ST	Wd-FD	No	....	No	RC	None	....	15	....	
..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	G. Elias & Bros.—MF
105	45	1250	19	15,000	100	525	20	Wl-ST D	Wd-F	Yes	C	No	TR	....	....	No	....	
125	45	1050	10	16,000	100	625	20	Wl-ST	Wd-F	Yes	SC	No	RC	....	....	..	....	Elias—Airmobile
..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	
120	55	580	12	18,000	160	1050	18	Wl-ST	Wd-F	Yes	S-CP	Yes	Hy	F	....	20	....	Fairchild—FC-2W land
110	58	420	21	12,000	160	950	18	Wl-ST	Wd-F	Yes	S-CP	....	....	F	....	20	....	Fairchild—FC-2W sea
103	53	580	27	13,100	110	710	15.5	Wl-ST	Wd-F	Yes	S-CP	Yes	Hy	F	....	10	....	Fairchild—FC- land
..	53	1250	36	12,700	110	650	15.5	Wl-ST	Wd-F	Yes	S-CP	....	....	F	....	10	....	Fairchild—FC-2 sea
105	40	..	..	....	84	750	10	Wl-ST	Wd-ST	Yes	SC	Yes	Arl	....	....	..	....	Federal Aircraft—CM-1
..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	
90	45	600	..	11,500	45	420	....	Wl-ST	Wd-F	Yes	DeD	B	O	....	....	..	....	Gillis—Crusader
100	50	750	..	14,000	80	650	12	D-cor.	D-cor.	Yes	SPD	Yes	O	H	$2500	..	5%	Hamilton—H-19
115	55	1250	..	18,000	150	750	21	D-cor.	D-cor.	Yes	SPD	Yes	O	H	$3000	..	5%	Hamilton—H-21
65	32	200	..	....	3.3	120	....	R-ST	Wd-F	No	SC	No	RC	....	....	..	....	Heath—Parasol
..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	
87	35	600	..	10,500	40	450	....	Wd	.....	....	S	Ex.	O	....	....	35	5%	International—F-17
120	35	1000	..	16,000	66	700	....	Wd	Wd-F	....	S	Ex.	O	....	....	Apl	5%	International—F-17
110	40	800	..	15,000	106	1000	....	Wd	Wd-F	....	S	Ex.	O	....	....	Apl	5%	International—F-18
85	46	650	35	11,000	65	500	12	ST-D	Wd-F	Yes	DeD	No	O	....	....	Apl	5%	Ireland—Neptune
75	28	400	65	12,000	8	300	1.7	Wd	Wd-F	Yes	SC	....	RC	W	$175	..	6%	Irwin—M-T-2
..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	
..	..	800	..	14,000	60	..	....	Wl-ST	Wd-F	....	....	....	....	....	....	..	....	Keystone—Pronto
..	57	570	..	....	..	500	....	Wl-ST	Wd-F	....	....	....	....	....	....	..	....	Keystone—Pathfinder
90	35	750	45	14,000	27	400	6	Wd	Wd-F	No	SD	No	Grs.	....	....	Apl	Yes	Kinner—Airster
..	39	548	..	12,000	..	400	....	Wl-ST	Wd-F	Ex.	SD	No	RC	EH	$1,000	19	5% N	Kreider-Reisner—Challenger
..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	
10	40	1350	10	....	80	600	....	DT, S	Wd-F	....	SPA	....	....	....	....	..	....	E. M. Laird—Commercial
105	40	..	15	....	..	..	....	Wl-ST	Wd-F	Yes	DeD.	Std	RC	....	....	..	....	Laird—Whippoorwill
..	35	600	..	....	42	500	....	Wl-ST	Wd-F	....	....	....	....	....	....	28	....	Lincoln—Page
110	50	1000	16	15,900	100	700	10	W-mon.	Wd-P	Yes	SC	H	RHy	E	....	Apl	5%	Lockheed—Vega
135	55	1460	10	17,250	100	1000	18	W-mon.	Wd-P	Yes	SC	H	RHy	....	....	Apl	5%	Lockheed—Air Express
..	50	..	..	14,000	140	650	....	Wd-D	Wd-F	Yes	DeC	Ex.	RC	....	....	34	....	Loening—Amphibian
108	49	1000	..	16,000	83	700	10-11	Wl-ST	Wd-F	....	SC	S	Grs	E	....	25	Yes	B. F. Mahoney—Ryan B1
120	48	1375	..	....	150	1000	18	Wl-ST D	D	Yes	DeDC	S	Arl	....	....	..	....	Metal—Flamingo
90	35	800	..	12,000	..	360	20	Wl-ST	Wd-F	Yes	S	Std.	Arl	....	....	..	....	Mohawk—Pinto
87	35	700	35	....	25	400	4	Wl-ST	Wd-F	Yes	SP	....	RC	....	....	22	Yes	Meno Aircraft—Monocoupe
85	35	600	..	15,000	35	396	8	Wl-ST	Wd-F	No	S	No	RC	....	....	29	....	National Airways—Air King
..	30	925	..	....	..	360	....	Wl-ST	Wd-F	....	SC	Std	....	....	....	Apl	....	Nilee—Williams
90	35	500	25	12,500	38	400	9	Wl-ST	Wd-F	Ex.	SPD	Ex.	RC	EH	$1,000	36	....	Pheasant—H10
105	45	1600	..	11,000	60	600	....	Wl-ST	Wd-F	Yes	S	Yes	Arl	....	$900	18	5%	Pitcairn—Mailwing
82	45	..	..	....	35	400	....	Wl-ST	Wd-F	....	S	....	Grs	....	....	..	Yes	Pitcairn—PA-4
95	52	500	25	11,000	110	400	21	D-cor.	D-cor.	....	....	B	Grs.	....	....	..	....	Prudden-San Diego—T-M-1
..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	
..	45	..	..	....	42	..	....	Wd-D	Wd-F	....	DeCP	....	....	....	....	..	....	Richmond Airways—Sea Hawk
..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	
100	51	400	..	11,000	326	1000	25	Wd-D	DOR, B	....	De D	....	RDO	....	....	..	5%	Sikorsky—S36
112	58	650	..	15,000	370	790	50	DOR, B	DOR, B	....	De D	Hy	RDO	....	....	Apl	5%	Sikorsky—S37
110	40	1000	17	16,000	..	1250	5.5	Wl-ST	Wd-F	Yes	S	....	....	....	....	..	5%	Simplex—Red Arrow
90	38	625	..	12,000	50	500	7	Wl-ST	Wd-F	Yes	PC	St.	RHy	D	....	Apl	5%	Stearman—C-2-K
110	41	1000	..	18,000	65	620	11.5	Wl-ST	Wd-F	Yes	PC	St.	RHy	D	$1,200	Apl	5%	Stearman—C-2-B
100	46	600	..	13,500	70	600	11.5	Wl-ST	Wd-F	Yes	DeD	St.	....	M	$2,500	24	5%	Stinson—SB-1
105	55	750	..	14,000	90	700	11 5	Wl-ST	Wd-F	Yes	DeD	St.	RC	M	$2,500	16	5%	Stinson—SM-1
95	45	..	..	....	40	600	....	Wl-ST	Wd-F	Yes	D	Yes	Hy	....	....	..	....	Stinson—Junior
..	37	100	..	....	44	600	....	Wl-ST	Wd-F	....	S	....	RC	....	....	..	....	Spartan—C-3
100	59	..	..	14,000	235	540	9	D-cor.	D-cor.	Yes	DeD	St	O	....	....	..	....	Stout—Ford—4AT
..	35	600	..	....	36	500	....	Wl-ST	Wd-F	....	....	....	RC	....	....	21	....	Swallow—Commercial
..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	
..	..	..	..	....	50	..	....	Wl-ST	Wd-F	....	S	....	....	....	....	..	....	Texas—Temple
..	..	..	..	....	120	..	....	D-cor.	D-cor.	....	De	....	Grs.	....	....	..	....	Thaden Metal—T-1
95	32	..	..	15,000	43	..	....	Wl-ST	Wd-F	....	S	....	....	....	....	..	....	Thunderbird
..	40	..	..	....	42	410	8	Wl-ST	Wd-F	Yes	SPC	No	RC	....	....	30	....	Travel Air—2000
..	45	..	..	....	60	..	12	Wl-ST	Wd-F	Yes	SPC	No	RC	....	....	32	....	Travel—4000
98	57	750	..	15,000	78	700	12	Wl-ST	Wd-F	Yes	DeD	Yes	O	....	....	..	....	Travel Air—6000
..	37	..	..	....	42	475	....	Wl-ST	Wd-F	Yes	SPC	....	RC	....	....	37	....	Travel Air—Caminez
..	42	..	..	....	60	650	....	Wl-ST	Wd-F	Yes	SPC	....	RC	....	....	38	....	Travel Air—Siemens
82	40	670	37	11,000	28	500	5 25	Wl-ST	Wd-F	Yes	SPD	....	Hy	....	....	..	....	Wallace—Tourcplane
90	35	600	..	14,000	40	350	8	Wd Wl8	Wd-F	No	S	....	C	E	....	Apl	5%	Whites—Humming Bird
85	30	600	20	12,000	..	500	8	Wl-ST	Wd-F	No	SC D	No	RC	Own	$1,000	No	5%	Western—King Bird
85	35	600	..	20,000	300	1000	20	Wl-ST	Wd-F	Yes	C	Yes	Arl	No	....	..	Yes	Zenith—Albatross

USELAGE AND WING CONSTRUCTION:
Bolted
—Corrugated
Duralumin
Fabric cover
—Monocoupe
Open section
MA1652:
Beadix
Extra
Hydraulic

P—Plywood cover
R—Riveted
S—Steel
T—Tubing
Wd—Wood
Wl—Welded

L—Lockheed
S—Sausedde
Std—Standard

LIGHTS:
N—Navigation lights

CONTROL:
A—Arens
C—Cables
D—Dual
De—Wheel
P—Push rods
S—Stick

SHOCK ABSORBER:
Arl—Aerol
C—Chord
D—Compression
Grs—Gruss
Hy—Hydraulic
O—Oleo
R—Rubber
T—Trombone

GUARANTEE:
N—New

PONTOONS:
D—Duralumin
E—Edo
F—Fairchild
H—Hamilton
M—All metal
W—Wood

TYPE CERTIFICATE:
Apl—Applied for and is pending

Last Minute Briefs

According to a cablegram, Capt. George Wilkins and Lieut. Ben Eielson, who flew in their Vega plane from Point Barrow, Alaska, to Spitzbergen, will arrive in New York from Oslo on June 19. A tour of the country in their Lockheed plane is planned by the fliers.

As we go to press, Capt. Emilio Carranza, Mexican flier, has arrived at Bolling Field, Washington, D. C., having continued from Mooresville, N. C., where he was brought down in his non-stop flight attempt from Mexico City to the United States capital.

General Nobile and his crew of 17 were, it developed, brought down in the dirigible Italia at Northeast Land, something more than 200 mi. to the northeast of Kings Bay, Spitzbergen. Efforts are still being made at this writing to reach the explorers, who, it is said, have been divided into three groups by the treacherous flow ice on which they landed.

A new airport was recently established at New Orleans when the Louisiana Airways, Inc., and the Mereaux-Nunez, Inc., real estate dealer, combined form the Mereaux-Nunez Airport on the St. Bernard Highway lying a few miles from the city limits.

The Pilot Laboratories of Brooklyn, N. Y., radio parts engineering and manufacturing company, have purchased a Stinson-Detroiter plane especially built for radio research work. The plane is being fitted with special experimental apparatus.

Dr. Frederick L. Hoffman, consulting statistician of the Prudential Insurance Co., is undertaking an air trip to the Pacific Coast primarily to study aviation hazards and their relation to insurance.

Prof. Henry J. Cox, Government weather forecaster at Chicago, is to make a study of airport and meteorological stations in England and Ireland during July, with a view to learning the type of aeronautical weather service offered in those countries.

The Loening Trophy intercollegiate air race, which was to have taken place at Mitchel Field, L. I., June 16, has been postponed until September 1. Students will thus be given more time to qualify under the altitude competition.

Russell J. Brinkley, Hill Airport manager at Latrobe, Penna., has resigned his position to become associated with the Commercial Aviation Service. His duties will consist of promoting, establishing, and managing airports in Pennsylvania.

Seven Selfridge Field, Mich., officers have received orders transferring them to Rockwell Field, Calif. They are Captains Pritchard and Elmendorf, Second Lieutenants Cornelius, Gregg, Hopkins, Williams, and Woodring, and First Lieutenant Strickland.

Dudley Steel and Ralph Hall have visited 17 cities between New York and Los Angeles by plane in a pathfinding tour to determine the route of the New York-Los Angeles air derby which is to precede the international air races on the Pacific Coast in September.

The Detroit Air Appliance Co., manufacturer of high pressure injection starters for aero engines, announces that the firm's name has been changed to the Heywood Starter Corp.

Work on New York's municipal airport at Barren Island was begun on June 12. Dredges will pump 4,450,000 cu. yd. of sand to the field.

A world's record for indoor flight duration of a tractor model plane has been established by Carl V. Carlson, 15 yr. old Chicagoan. Carlson's plane remained in the air 4 min. 19 sec. in a contest held at the 132 Infantry Armory, Chicago.

Senator Hiram Bingham, member of the Senate Committee on Military Affairs and sponsor of a five year air program for the United States, will sail for Europe on July 4 to study development of aircraft and airways in France, England, and Italy.

Orange-red rays, which it is said will be visible to pilots 100 mi. distant, are to be cast by the new Byrd Beacon, to be erected atop the Broadway Temple in New York City.

B. Russell Shaw Co., Inc., St. Louis airport engineering firm, has been awarded a contract by the City of Evansville, Ind., to design and supervise construction of a municipal airport. The city council has recommended a bond issue of $180,000 for the field.

Twenty-two weather observation posts are to be established by the Guggenheim Fund between San Francisco and Los Angeles and between the Pacific Coast and the Sierra Nevadas to supply information for the Western Air Express line.

Jerome A. Hunsaker, vice president of the Bell Telephone Laboratories, has been named as third member of the T.A.T. technical committee of which Colonel Lindbergh is head. Charles S. "Casey" Jones was named some time ago. Hunsaker is to evolve a two-way ground to plane communication system.

R. W. Ireland, general traffic manager of the N.A.T., and Maj. H. H. Arnold of the Air Corps, have completed arrangements for 19 hr. Washington to Brule, Wis., air mail service for the use of the President during his vacation at Brule.

National Air Transport, Inc., has built a new office building at the Municipal Airport, Chicago, which is to house the general offices of the company. The Division of Traffic office will be located in room 1611, Bankers Building, Chicago.

Having completed and flown an experimental model plane, production is being started by the Brunner Winkle Aircraft Corp., Glendale, L. I., N. Y. An article concerning the "Bird", the company's open cockpit biplane, will shortly appear in AVIATION.

Announcement from the Office of the Chief of the Air Corps states that no surplus hangar material is available for distribution. All materials will be utilized during the five year period of expansion.

Thea Rasche has received her new Bellanca monoplane, a craft similar to the Martine Bellanca in which Chamberlin and Williams made several duration attempts last winter. A Wright Whirlwind powers the plane.

Order for 105 Pratt & Whitney Hornets And 10 Wasps Placed by Boeing Company

AN ORDER for 105 Pratt & Whitney 500 hp. Hornet engines and 10 of the 400 hp. Wasp engines was recently placed by the Boeing Airplane Co. of Seattle, Wash. Negotiations with the Pratt & Whitney Aircraft Co. were concluded at the engine company's plant in Hartford by P. G. Johnson, president of the Boeing Airplane Co., and Edward Hubbard, operations manager of the Boeing Air Transport Co.

Since July 1, 1927, Boeing Air Transport has operated the transcontinental air mail from Chicago to San Francisco, using Boeing mail planes equipped with Pratt & Whitney Wasp and Hornet engines. A short time ago Boeing took over the Pacific Air Transport, which operates the mail and passenger route from Los Angeles to Seattle. Still further extensions are being planned by Boeing Air Transport. They are now operating about 6000 mi. daily and it is expected that this will be increased to approximately 8000 mi. in the near future.

The monetary value of the engines just purchased from the Pratt & Whitney Aircraft Co. is approximately $1,000,000 and constitutes the largest order for commercial equipment of record. While some of the additional engines will be placed in single engined mail planes a number of the Hornets will be used in tri-engined air liners capable of carrying 12 passengers, with baggage, a thousand pounds of mail or express, together with two pilots. These air liners are primarily for passenger carrying between Chicago and San Francisco but will also be used in connection with some of the plans for new routes.

Packard Electric Co. Executives Touring The Country in Stinson-Detroiter Plane

EXECUTIVES OF the Packard Electric Co. of Warren, O., automobile ignition cable and electric transformer manufacturer, are now touring the country in the firm's six passenger Stinson-Detroiter visiting factory branches and calling on wholesale distributors. The party arrived at Mitchel Field, N. Y., Friday June 8 and attended a dinner and sales meeting at the Hotel Manger, New York City.

Those in the party are: N. A. Wolcott, president of the Packard company; B. N. MacGregor, sales manager of the cable division; John S. King of Cleveland, advertising counselor; and Lieut. M. E. Headley, pilot and aircraft engineer, formerly a member of the 28th Pursuit Squadron.

Following the New York visit, the flying schedule called for flights to Newark, N. J., Philadelphia, Penna., Baltimore, Md., Washington, D. C., and Harrisburg, Penna., for further conferences and dinners with company representatives. Returning to Ohio from Pennsylvania, the group plans to fly to the West Coast.

John S. King, advertising counselor of the party, has purchased a Stinson-Detroiter Junior for service to clients of his Cleveland agency. King did observation and inspection work during the World War.

Chicago-St. Louis Ford Airplane Passenger Service Being Formed by Robertson Company

ORGANIZATION OF a passenger service between St. Louis and Chicago, with tri-engined Ford monoplanes making two trips daily between the cities, has been announced by the Robertson Aircraft Corp. of St. Louis, holder of the St. Louis-Chicago and St. Louis-Omaha air mail contracts.

The new service will begin on August 1 under present plans, and service to Omaha, connecting with the N.A.T. southwestern line at Kansas City and the Boeing transcontinental line at Omaha, will be inaugurated later. The first of a projected fleet of 14 airplanes—four Ford monoplanes—have been ordered and are scheduled for delivery on July 15.

For The Discriminating Purchaser:

THE AIRSEDAN

AIRLINE OPERATORS will find this plane meets with all their requirements. The cabin has exceptionally comfortable seats for four large passengers and the pilot's visibility is unexcelled.

PRIVATE OWNERS will approve of the fine appointments which are selected to satisfy the most critical taste.

CORPORATIONS desiring to keep step with the progress of the times will find that here is an efficient and up-to-date vehicle for transporting executives and personnel to widely separated branches.

We will be glad to assist you in determining the adaptability of this fine product to your requirements.

BUHL AIRCRAFT COMPANY
Marysville Michigan

Small Engines
FOR LIGHT PLANES

Immediate Delivery From Our Stock

New ABC Scorpion Air Cooled

Two cylinder opposed, 39 hp. at 2550 r.p.m., weight 112 lb. complete, price $1,030, including tools.

Bristol Cherub used 5 hours

Two cylinder opposed, 32 hp. at 2900 r.p.m., weight 100 lb. complete, price $1,200 with tools.

Note: These engines are right hand tractors and fitted with latest dual ignition 8 impulse starters. Installation drawings and instruction book free to purchaser.

JOHNSON
Airplane and Supply Company

Dayton Ohio

Boeing Air Transport and P.A.T. Report On Traffic Since Beginning of Operations

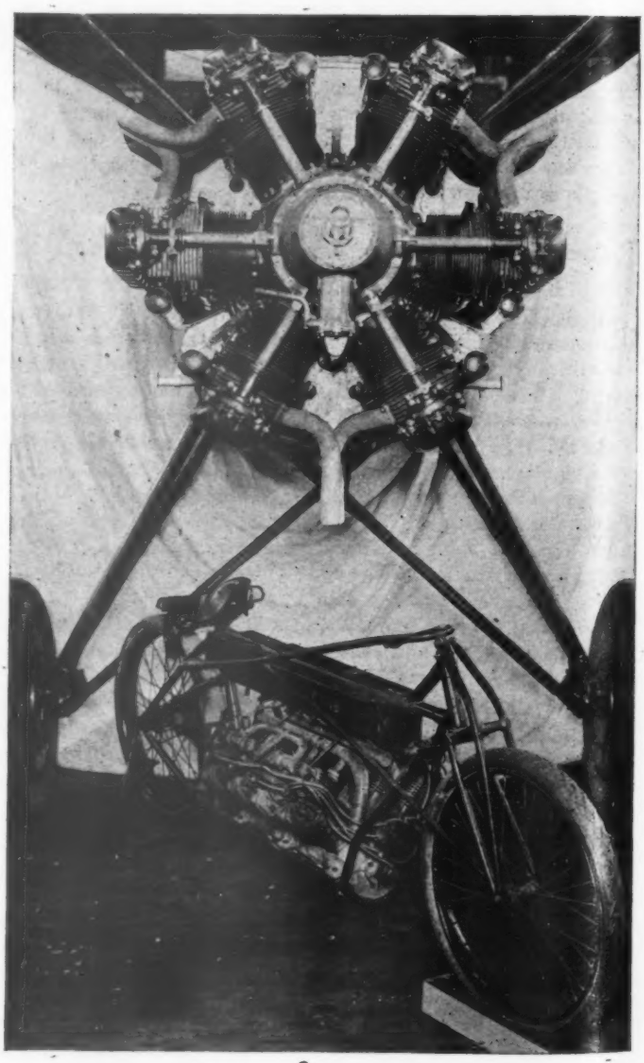
FOLLOWING ARE total traffic figures for Boeing Air Transport, since beginning of operations on July 1, 1927, to May 1, 1928:

Miles flown	1,300,000
Pounds mail	500,000
Passengers	1,100
Passenger miles	780,000

Total traffic figures for Pacific Air Transport, since the beginning of operations Sept. 1, 1926 to May 1, 1928:

Miles flown	1,150,000
Pounds mail	125,000
Passengers	1,500
Passenger miles	750,000

New and Old



The newest of air cooled engines—and one of the first. Beneath the new Curtiss Chieftain 600 hp. engine is shown the motorcycle, designed and built by Glenn H. Curtiss, in which this aviator and inventor established a world record of 136 m.p.h. at Daytona Beach, Fla., in 1907. The motorcycle engine is an air cooled power plant of eight cylinders.

Aero Club of New Brunswick

Continued from page 1769

ed that notice of the amendment or amendments proposed shall have been sent to the membership at least twenty days before such meeting. It shall be the duty of the Secretary to send such notices to the members when so ordered by the President or any other officer of the club or when twenty members of the club shall so request in writing. Votes on the proposed amendment or the election of officers may be deposited with the Secretary at any time before the meeting and by him cast for such absent voter at the meeting. The ballot shall be in writing.

BY-LAWS

Article 1.

Membership

(1) The membership is divided into two classes—active members and associate members.

(a) An active member is a member who contributes and who takes an active part in the flying activities that the club undertakes.

(b) Associate members are members who take a general interest in aeronautics.

(2) Any person a resident of the State of New Jersey is eligible to membership in this club.

Article 2.

Dues

Dues for all members shall be Five ($5.00) Dollars per annum.

Active members shall contribute in addition to the sum of Five ($5.00) Dollars the sum of Two Hundred ($200.00) Dollars to become such active member which contribution shall be the only requirement to become such active member.

Dues shall be payable in advance and prorate after the first year.

Article 3.

Election of Members

Any person who shall pay his dues shall become eligible to membership.

Article 4.

Notices to Members

Every member shall leave with the Secretary his mailing address where all notices may be mailed to him.

Article 5.

Nomination of Officers

Nomination for officers shall be made at the regular November meeting of each year directly from the floor by members of the organization then present at the meeting and the election of such officers shall take place at the regular December meeting. Officers elected shall take charge and be installed at the regular meeting in January. All officers are elected for one calendar year.

Article 6.

Officers

The officers of this club shall consist of the President and two Vice Presidents, a Secretary and a Treasurer, an auditing committee shall be appointed by the President.

President (a) It shall be the duty of the President to preside at all meetings and to see that order is maintained and the regular routine and duties of the organization are carried out. In the case of a tie vote he shall determine the issue.

Vice President (b) In the absence of the President the Vice President shall be vested with the duties of the President.

Secretary (c) It shall be the duty of the Secretary to keep accurate records of this association and to record the same in books to be kept for that purpose. He shall keep an accurate record of the addresses of the members and notify members of the meetings and of any changes in the Constitution and By-Laws.

Beauty and Style

mark these two- and three-place personal flying ships

Prices (Subject to Change)

$2,875 and $3,600

with LeBlond Engines

Write or Wire for Dealer Territory Now Open

OHIO AERO MANUFACTURING CORPORATION

1471 South Ave. Youngstown, Ohio

Treasurer (d) It shall be the duty of the Treasurer to receive all moneys paid into the club from all sources whatsoever and to deposit the same to the account of the Association in the New Brunswick Trust Company and at the direction of the Association to pay all orders or debts against the club. Said orders to be paid by checks drawn on said bank and said checks to be signed by himself together with any officer. He shall at each regular meeting report to the club the amount of money remaining in the Treasury unappropriated, and "shall show receipts and expenditures. Any two officers of the Association to sign checks." "Amendments."

Auditing Committee (e) The auditing committee shall be appointed by the President and shall hold office for the term of one year. They shall annually make a thorough audit and inspection of the books of the Secretary and Treasurer and report their findings to the club.

Article 7.

Meetings

This club shall meet every fourth Tuesday of each month. Special meetings of the club may be called by any two officers or any ten members of the organization by requesting the same in writing and presenting personally to the Secretary such request. Such notices should be presented to the Secretary within ten days of the time such meeting is desired.

Article 8.

The order of business of this club shall be:—

(1) The reading of the minutes of the previous meeting.
(2) Treasurer's report.
(3) Report of standing committees.
(4) Report of special committees.
(5) Old business.
(6) New business.
(7) Adjournment.

The order of business may be changed at any time by a majority of the members present at a meeting.

Article 9.

Amendments

These By-Laws may be amended on twenty days notice by the majority of the members present at such meeting. The Secretary shall send out notices giving each member a twenty days notice of such proposed amendment to the By-Laws.

The Wallace Touroplane

Continued from page 1768

In the sides of the center section, which project beyond the fuselage, are the fuel tanks of 14 gal. each. Thus, the main fuel load is carried outside the fuselage yet on the center of gravity and all fuel lines are outside the cockpit. However, if larger engines are used, an additional tank is carried in the front of the fuselage. The center section spars are of greater depth than those of the outer wing panels. They are level with the tops of the cap strips of the ribs while those in the outer panels are centered between the top and bottom of the rib, as a spar the full depth of the wing would be too heavy. The entire upper part of the center section is covered with birch plywood, which replaces the center section drag wires. The lower part of the front spar is cut away to a depth of two inches over the width of the fuselage to permit better vision. Swaged tie rods are run along each spar, through the center section, connecting the wing hinges.

The external wing braces are of streamline Kawneer steel tubing, welded along the trailing edge. It is cadmium plated for protection and appearance. Universal joints are used in

For ships that land in the night

The G-E airport twin floodlight

The G-E airport twin floodlight, with a beam spread of 80 degrees in the horizontal plane and only six degrees in the vertical, gives the necessary illumination for landing.

It uses incandescent MAZDA lamps and is, therefore, inherently suited for remote control. Trained operators are not required. Ask the aviation lighting specialist at the nearest G-E sales office.

Complete Lighting Equipment for Airports and Airways

Airport Floodlights
Beacons
Boundary Lights
Control Equipment
Transformers
Wire and Cable

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GENERAL ELECTRIC

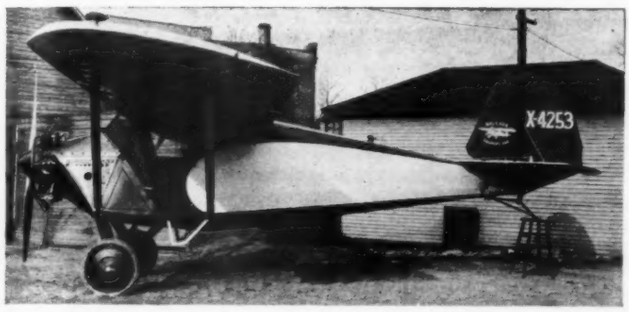
GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

THANK YOU *for mentioning* AVIATION

making connections to the wings in the case of both struts, and to the fuselage in the case of the rear strut.

The fuselage is rectangular in section with four longerons and Pratt truss bracing and wires. The members are all seamless steel tubing with none smaller than 5/8 in. by .035 in. in the side truss or in the engine mount. The smallest members in the top and bottom trusses are ½ in. by .035 in. The tubes in the bottom truss, to which the wing braces are attached, are reinforced with 7/16 in. tie-rods. The rear of the upper part of the fuselage, or turtle deck, is built up of spruce cap strips. The fabric covering is separated from the structure by felt strips. The engine mount, on the front, is of welded steel tubing. It is pinned to the fuselage at four points with nickel steel bolts and is readily detachable for the substitution of another engine.

A side by side seating arrangement, with dual control, is used in both planes. In the larger model the third seat is slightly to the rear and in the center of the cabin. There is a ten inch space between the two forward seats. The seats are heavily upholstered and quite comfortable. Safety belts are provided and there are metal boxes for tools under the forward seats. By folding up the rear seat, a luggage com-

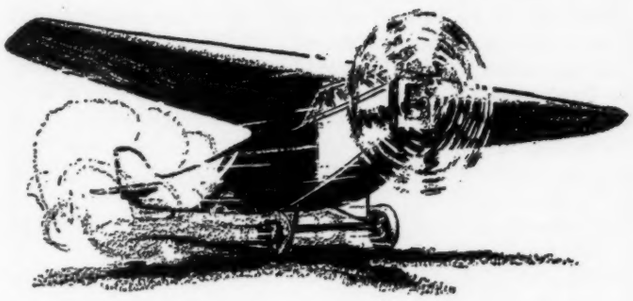


Side view of the Wallace Touroplane.

partment of 12 cu. ft. is afforded. There are two doors, one on each side of the fuselage, allowing easy entrance or exit. Triplex safety glass windows are used, giving ample vision in all directions. The floors are covered with linoleum and the walls are insulated to deaden noise and keep out extreme temperatures. There is a dome ceiling light in addition to the concealed light on the Elgin unit instrument board. All standard instruments are provided, as required by the Department of Commerce. Only one stick is used for the dual control, though there are two pairs of rudder pedals. The stick has a short cross member at the top so that it is convenient to both seats. Two throttles are provided, one on each side of the fuselage. The rudder pedal control is quite original; the foot rests are mounted off center on the pedal column. Normally the foot is in line with the pedal column, but when it is desired to use the wheel brakes, one slides one's foot towards the outside and thus twists the pedal, actuating the brake through a series of cables and bell cranks with an Ahrens control mounted on the landing wheel. The pedals actuate the rudder through cables in the usual manner. Push rods and bell cranks are used for the other controls except the stabilizer adjustment, which employs an Ahrens control actuated from between the seats of the cockpit. All the controls are hidden below the flooring.

The control surfaces are constructed of welded steel tubing, the rudder and fin being interchangeable. The fin and horizontal stabilizer are made in the same jig but use different fittings.

The landing gear is of the divided type employing an oleo and spring type shock absorber. The members are attached to the fuselage longerons, and mounted with universal joints with lugs of cast manganese bronze. It is claimed that by having the chassis mounted with universal joints, the fuse-



When he "gives her the gun" ... will the field be clear?

When the pilot heads his ship into the wind and "gives her the gun", a clear field is a necessity. He has no opportunity to dodge persons wandering thoughtlessly about the field — an attempt to change his course will likely end in disaster.

Give pilots all the distance the field affords for taking-off. Keep visitors in a safety zone with a strong Anchor Chain Link Wire Fence.

Anchor Fences are made in all heights and types for every need. Attractive appearance and everlasting service are provided through the Exclusive Anchor Features: (1) U-bar Line Posts. (2) Square Terminal Posts. (3) Drive-Anchorage. (4) Anchor-Weld Wire Gates.

Anchor Nation-Wide Fencing Service places fencing specialists and trained erectors at your disposal. Phone or write the nearest Anchor District Office for complete information.

ANCHOR POST FENCE CO.
EASTERN AVENUE AND 35TH ST., BALTIMORE, MD.

Albany; Boston; Charlotte; Chicago; Cleveland; Detroit; Hartford; Houston; Indianapolis; Los Angeles; Mineola, L. I.; Newark; New York; Philadelphia; Pittsburgh; St. Louis; San Francisco; Shreveport.
Representatives in all principal cities.

ANCHOR Fences
Buy the fence with
1. THE STRONGEST POSTS
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A NATION-WIDE FENCING SERVICE

lage is relieved of twisting strains when landing, and if the chassis should be injured or wiped off in an accident, adjoining fuselage members are less likely to be distorted. All bolts are nickel steel. The front chassis strut, which contains the shock absorber, is round steel tubing covering with aluminum fairing. The rear strut is a streamline tube welded along the trailing edge. The axle is chrome molybdenum steel tubing, heat treated to a strength of 130,000 lb. Bendix wheels and brakes are used.

Specifications of the Wallace C-2 Touroplane, as supplied by the manufacturer, are as follows:

Length overall	23 ft. 6 in.
Height overall	7 ft. 6 in.
Wing span	37 ft.
Chord	5 ft. 10 in.
Wing area including aileron	205 sq. ft.
Aileron area	31 sq. ft.
Stabilizer area	22 sq. ft.
Elevator area	16 sq. ft.
Rudder area	8 sq. ft.
Fin area	6 sq. ft.
Weight empty with 80 hp. Anzani engine	850 lb.
Useful load	650 lb.
Pilot	160 lb.
Fuel	160 lb.
Oil	30 lb.
Actual pay load	2 passengers
Gross weight loaded	1500 lb.
Rated horsepower	80 at 60 r.p.m.
Fuel capacity	28 gal.
Oil capacity	4 gal.
High speed	97.1 m.p.h.
Landing speed	40 m.p.h.
Climb at sea level	670 f.p.m.
Service ceiling	11,000 ft.
Cruising speed	82 m.p.h.
Stalling speed	43.1 m.p.h.
Time to 10,000 ft.	35 min.
Range	500 mi.
Fuel consumption at cruising speed	5¼ gal. per hr.
Oil consumption at cruising speed	.40 gal. per hr.

Fuselage Analysis

Continued from page 1767

concerned. If the summation moments of our panel loads was zero the entire system would now be in equilibrium and ready for solution. However we now face the same difficulty we did in the level landing condition. That is, we have removed the weight of the chassis in our panel load computations but have maintained the original C. G. position. We must therefore replace the moment lost when the chassis was removed before summation of panel moments will equal zero. We found in the previous chapter that the moment of the chassis about the C. G. is —5895 in. lb. Replacing this by a couple at panel points 3 and 5 gives 5895/32.5 = 181 lb. acting down at 3 and up at 5 to give an equivalent moment. These forces of 181 lb. are drawn perpendicular to the ground line in Fig. 80. This does not give the full arm of the couple of 32.5 in. which we just used in the calculations. But —5895 in. lb. is no longer the true value of the chassis moment about the C. G. when the fuselage is inclined at an angle. The value of this moment has decreased in exactly the same proportion, namely cos 12°, as has the arm of the 181 lb. couple. What we have done above is really this: 5895 cos 12°/32.5 cos

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All RISKS

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Transportation Indemnity Company of New York

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11 South William Street
New York, N. Y.

STUART F. AUER, *Western Manager*
Aviation Department
Century Building
Milwaukee, Wis.

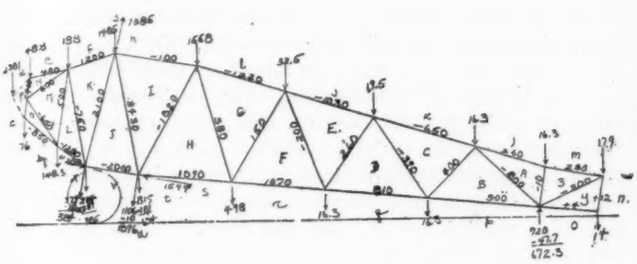
Applications Sent on Request

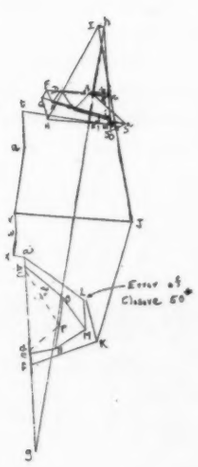
12° = 181 lb. By omitting the cosines we have simplified the problem and obtained the same result. Now our entire system is in equilibrium and ready for solution. The solution has been made in Fig. 80.

The error of closure of 50 lb. in Fig. 80 is reasonable considering the large scale that was employed. A scale of about 400 lb. to the inch would have been more accurate and convenient but limited space for publication dictated the larger scale. This now completes the investigation of the fuselage for the major conditions.

Miscellaneous Conditions.

The loads found in the seven major conditions will design most of the fuselage but there are several members we must investigate further. The most obvious of these members are those which carry the spar loads across the fuselage. If reference is made to the table in this chapter in which the fuselage members are designed it will be found that member 36 is designed for 9200 lb. compression. This is the axial





Three-Point Landing
Orig. Scale: 1000# = 1"
Fig. 80

load in the front spar in the high incidence condition which was found in Chapter 9. Member 38 will carry the axial load of the rear spar in low incidence. Member 50 should be investigated for the side components of the loads in the lift struts. The design load of this member is usually obtained from the inverted flight condition. In this condition the struts are in compression and exert a fairly large compressive force on member 50. Referring to Chapter 8 we find that the loads on member 50 for this condition are 3500 + 1648 = 5148 lb. Compression. It has been designed for this load in the design table. Members 36, 38 and 50 complete the carrying through of the wing loads.

If any members of the fuselage support weighs somewhere between panel points they are put in bending. These members must be investigated for the axial loads found in them plus the bending stress. Usually this bending stress is small and need not be considered. However when rudder bar or torque stick bearings are supported by members of the side truss or longerons they impose a large bending moment. These bearings should be placed as near a panel point as possible and a tripod of struts built up about them to tie together

"Ha! Walter! I hear you're teaching flying by Mail!"

"WHAT'S THAT, Buck? — I'm teaching *flying* by mail?"

"Sure, that's what I heard. Boy, that's *rich!* You're a great one. Just when they've made Aviation safe for Democracy, you give us a bunch of falling leaves with their joy-sticks in one hand and textbooks in the other. Well * * * I guess it's all right if you can get away with it. Pretty slick, I'll say, *pretty slick.*"

* * * Poor Buck's folks lived in Omaha, and I hated to ship him home alone. Our leading mortician helped me pick out a dandy box with gorgeous silver handles, and the newspaper notice asked "Omaha papers please copy." But something tells me that there may be more Bucks with the idea that I'm grinding out aviators while you wait. So let's have a friendly understanding.

What I Really AM Doing

I've had a few hours in the air myself, and you can add my merry laughter to any crowd that starts sizing-up *flying* instruction by mail. Yet you know as well as I do that an all-wool-yard-wide Aviation worker has to learn a lot on the ground first. It's classroom work at the flying schools. But a lot of chaps with the real stuff in them can't chuck everything to attend classes. So, my course—which is thorough, scientific, and practical—makes it possible for them to get the necessary knowledge at home, the "ground-work" of their training.

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all the nearby fuselage members. The members of this tripod are usually very short and 3/8 or 1/2 in. tubes are plenty strong enough to make the loads and make the bearing location rigid.

In many planes there are eccentricities in the fuselage structure. That is the center lines of members meeting at a panel point, do not all pass through the same point. When one member's center line passes some distance away from the point of intersection of the other center lines it imposes a considerable moment on those members. This is especially true of loads transmitted from the wings to the fuselage. These loads are so large that even a small eccentricity may cause considerable trouble. It is quite essential then that the neutral axis of the spars be in a direct line with the members carrying the spar loads across the fuselage. Where eccentricities are present it may be assumed there are none in solving for the seven major conditions but the bending due to them must be taken into account in the design of the affected members.

We have explained that several members must be investigated for carrying the wing loads through the fuselage. In landing with side load several members are also affected by large loads which they do not have in any other condition. Members 48, 36, and 50 in particular are affected by this consideration. In our plane these members have been made sufficiently large to care for any probable loads.

Design of Fuselage Members.

The fuselage will be designed for a coefficient of restraint of 2. This is the value allowed for a welded fuselage. Due to a typographical error a value of C = 3 for welded fuselages was given in Chapter 11. This value is much too high, C = 2 being the correct value. For the engine mount a value of C = 1 is used because usually this unit is made detachable and one end of the struts is pinned. Perhaps C = 1½ would be a fairer value but a little extra strength in this portion of the plane is not unwelcome. The charts of Figs. 42 to 44 of this series were used in designing the fuselage members.

The key to the numbers of the members used in the table is that given in Fig. 71 of Chapter 11. The loads listed under each condition are those obtained from its analysis in the figures of the last three chapters. The loads obtained in the fin and rudder condition are made plus or minus because if the load were acting in the other direction on these surfaces than that we assumed all the loads in the members would be just reversed in sign. The design condition and load is of course that in which the member is most severely stressed. Usually the design condition is in compression because under this type of stress a tube is less strong than when in tension. Oftentimes however the maximum compression load is appreciably smaller than the maximum tension load as in members 16, 17, and 33 of the table. In these cases the tube is investigated for both types of stress.

The lengths of the members may be measured off an accurately drawn diagram of the fuselage structure. As was stated in the original design of the plane all members but the engine mount would be chrome molybdenum steel tubing. The engine mount is mild carbon steel (1025).

In determining the size of the longerons an effort has been made to require as few different sizes as possible. In addition using long lengths of one size of tubing saves many welds and makes the entire proposition of lining up the fuselage much easier. The disadvantage of course is the additional weight of using tubes a little over strength. This increase in weight is small however compared to the whole structural weight of the plane. In the case of the longerons on this plane it probably doesn't mean more than two pounds additional weight.

On small planes the sizes of tubes dictated by the axial loads which they must carry are so small that practical considerations demand that they be made larger. Handling con-

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siderations in particular must be taken into account. The Department of Commerce has set a minimum size and gage on tubes for various locations. No structural tube may be under 20 gage (.035 wall thickness). This is to prevent local failure due to wrinkling or burning of the wall in welding. For welded fuselages the minimum sizes of tubing to be used except in planes weighing less than 1000 lb. are:

⅝ × .035 for longerons and web members of the side trusses and members of the engine mounting.

½ × .035 for web members of the top and bottom trusses. These sizes are minimum sizes when the length of the member does not exceed 30 to 36 in. In our plane many of the tubes exceed this length and the minimum sizes have been increased one eighth of an inch in many cases. The necessity of using at least a practical size of tubing is the reason for the large margins of safety of many of the members. Good design dictates small margins of safety to save weight but other considerations are more important than weight saving as has just been explained.

The loads in the top and bottom trusses are fairly small and in many locations the minimum size of tubing may be used. Around the cabin however it is advisable to use larger tubes as here there are floor loads, torque loads, wing loads, etc.

Member 29, the tail post, is usually integral with the rudder post. It is best then to wait until the tail analysis designs the rudder post before assigning a size to this member.

The members around panel point 13L carry the tail skid loads and therefore must be made large. Members 27 and 58 in particular carry the loads of the skid in bending and were made overstrength for this purpose.

It must be remembered that the loads in low incidence must also be filled in the table. We have not done so because to save time and space we did not analyze this condition as it was quite similar to high incidence. Some of the design loads as we have them listed may not be true but for illustration purposes we have assumed that they are.

The size of the diagonal members 59 to 64 may be determined by a torsional method which is too advanced for this series of articles. It is the usual procedure to make them the same size as the surrounding members. Especially for a plane of our size this is perfectly safe as we must use a minimum size of tubing which in this location is over strength. We have therefore made these members ⅝ × .035 which will make the rear of the fuselage rigid against the torsional loads of the tail. This completes the design of the members of the fuselage.

In the next chapter the control surfaces, the tail skid, and the shock absorbing system will be analyzed. This will complete the analysis of the plane as required by the Department of Commerce.

Acknowledgement is made by the authors for the use of Air Corps publications as follows:

Date of Aviation 1928	Fig. No.	Fig. No.	Page No.	Air Corps Publication
April 2	38	12	56	Handbook of Instructions for Airplane Designers 1925
April 9	42	A-45	352	Airplane Design, 1926
	43	A-46	354	Airplane Design, 1926
	44	A-47b	356	Airplane Design, 1926
April 9	3	A-11	353	Airplane Design, 1926
	4	A-15	368	Airplane Design, 1926
	5	A-14	367	Airplane Design, 1926
	6	A-23	379	Airplane Design, 1926
	7	A-13	365-366	Airplane Design, 1926

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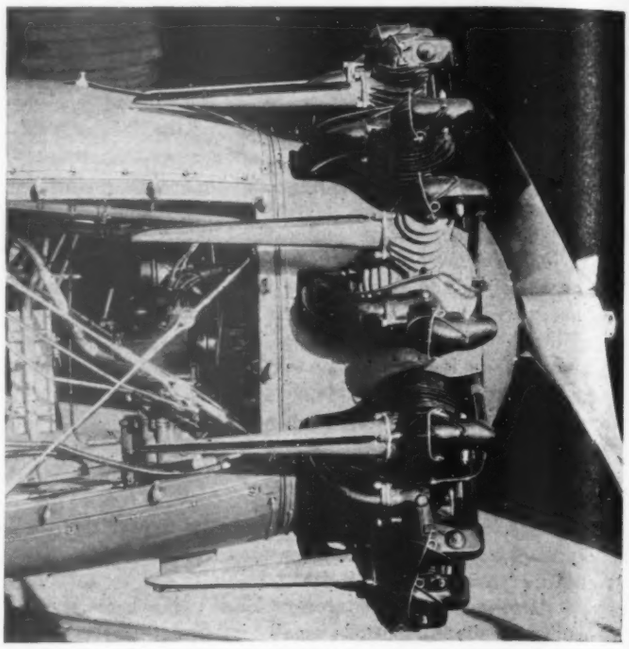
Engine Exhaust Silencers

Continued from page 1763

drawing the burned gases from the cylinders at a faster rate than normal and in this way increase the speed of the engine and the power. The Venturi type of muffler, which is rapidly becoming more popular because of its high efficiency, can do this. It consists of a venturi tube exposed to the airstream and surrounded by an expansion chamber connected to the exhaust manifold. The exhaust gases enter the expansion chamber which serves to regularize and slowly reduce their pressure. From there they are sucked into the Venturi, which is at less than atmospheric pressure because of the high velocity of the airstream passing through it. From the inside of the Venturi the gases continue out into the air current. Flaming gases enter the Venturi and are completely burned before their exit from the muffler, concealing the flames from exterior view. The first Venturi type of muffler is understood to have been used on racing automobiles about 20 yr. ago.

Perhaps the best known airplane muffler of this type is the "R.B." muffler, used extensively abroad and manufactured by Rochat & Barthemmy, Paris, France. It consists of a metal cylinder with the exhaust manifold pipe welded to one side. Inside the cylinder is a sort of Venturi with the back portion perforated with small holes or gills. The ends are open to the air so that when the airplane is in flight or the device is in the slipstream, air passes through the Venturi, creating a negative pressure in the rear walls where the gills are located. The negative pressure increases the velocity of the exhaust gases inside the device and the gases leave through the small gills and mix with the air that has entered the front end of the device. The fresh air contributes, in part, to the combustion of the gases on their issuance from the gills.



The Curtiss "cone and bayonet" type of exhaust on a Pratt & Whitney "Wasp" engine installed in a Curtiss "Hawk".

This takes place inside the muffler so that the flame of the burning gases cannot be distinguished from the outside. According to the manufacturer, the noise of the exhaust is eliminated and the pilot and passengers can converse in moderate tones. The climb and high speed of a plane is almost identical with and without the R.B. muffler, the difference being so

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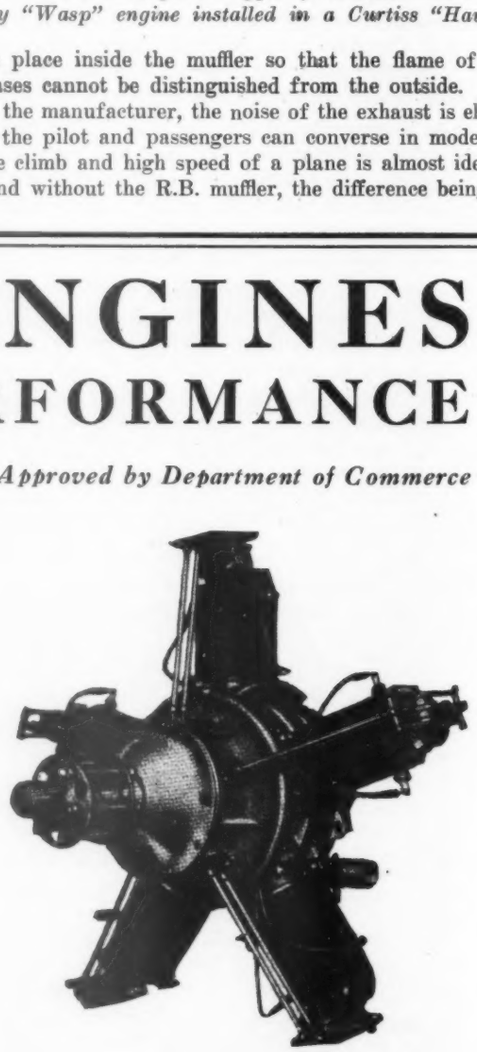

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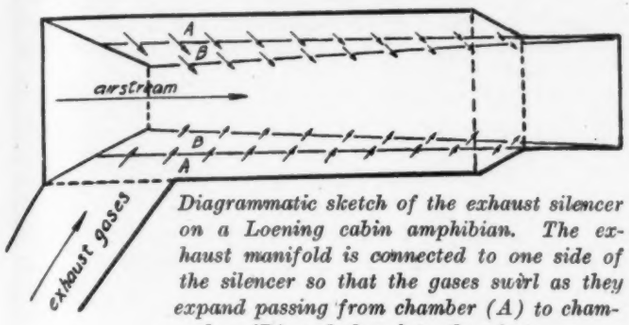
slight that it is negligible. The silencer weighs 19.85 lb. and two of these, one on each cylinder bank, installed on a Hispano-Suiza 300 hp. engine weigh 55 lb. with complete manifolding. The muffler is 2 ft. 5½ in. long and has an overall diameter of 6.3 in. The smallest diameter of the inner tube, or Venturi, is 2.37 in. This point is 7.8 in. from the front end.

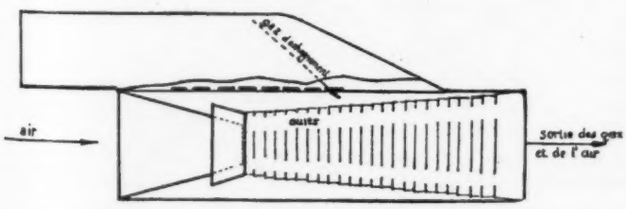
The muffler installed in the Loening commercial amphibian is of the Venturi type combined with the whirl type. A single muffler is used, connected to the top of the exhaust ring behind the cylinders of the Wasp engine. The silencer is slightly larger than the R.B. type, as only one is used for



Diagrammatic sketch of the exhaust silencer on a Loening cabin amphibian. The exhaust manifold is connected to one side of the silencer so that the gases swirl as they expand passing from chamber (A) to chamber (B) and then into the airstream.

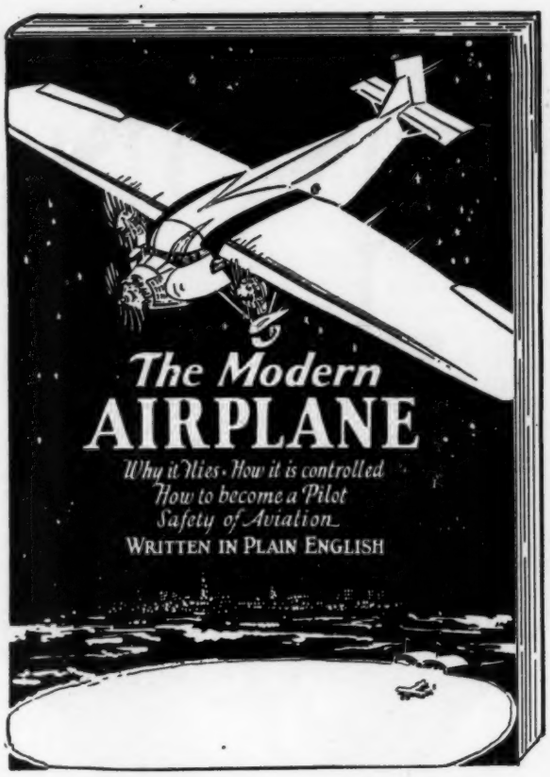
all the cylinders. The installation weighs 95 lb. complete with exhaust manifolding. It should be noted that the muffler is some distance from the engine, above the upper wing, and is connected by a large pipe. In design, it resembles the R.B. type except for a few details. The gills have been replaced by small holes and the shape of the Venturi has been simplified. The exhaust manifold, instead of being connected to the expansion chamber concentrically, is connected on one side so that the gases enter tangently and swirl in the expansion chamber. A baffle in the expansion chamber also tends to reduce their velocity. On the ground, with the muffler in the slipstream, it increased the speed of the Pratt & Whitney 400 hp. Wasp engine from 1630 to 1660 r.p.m.

A somewhat similar muffler is that designed for the Army a few years ago by the Dayton-Wright Airplane Co. This consists of a streamline body of sheet metal with both fore and aft ends open. Inside is a modified Venturi of sheet metal perforated with small holes. The space between the Venturi and the outside sheet of metal is called the expansion chamber. This has the exhaust pipe connected to it on one



Drawing of the French "R.B." muffler. Translation: gaz = exhaust gases, ouies = gills, sortie des gaz et de l'air = exit of the gases and air.

side so that the gases whirl in the chamber. In operation it is essentially the same as the types described above. It is more streamline and somewhat cheaper to make as it consists of two sheets of metal welded together at the ends and to a pipe connected to the exhaust manifold. An experimental installation of this type has been placed in a Fairchild monoplane, and though the noise was dampened considerably, the power loss and weight was thought too great to warrant its installation as standard equipment. Two mufflers of this type were installed, one on each side of the engine, and they are said to have caused an increase in back pressure in the



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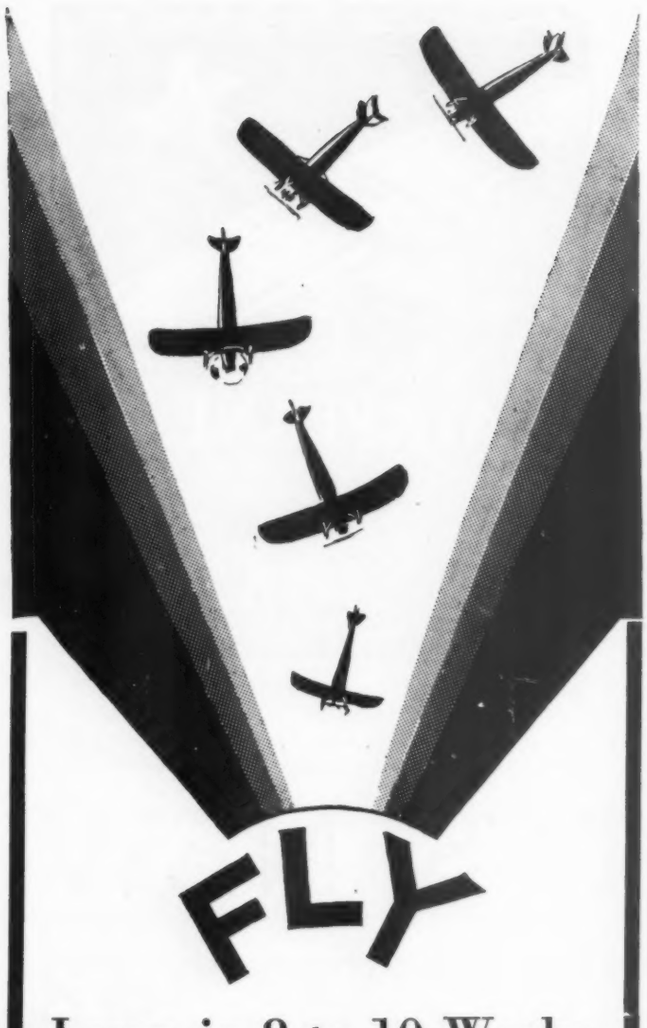

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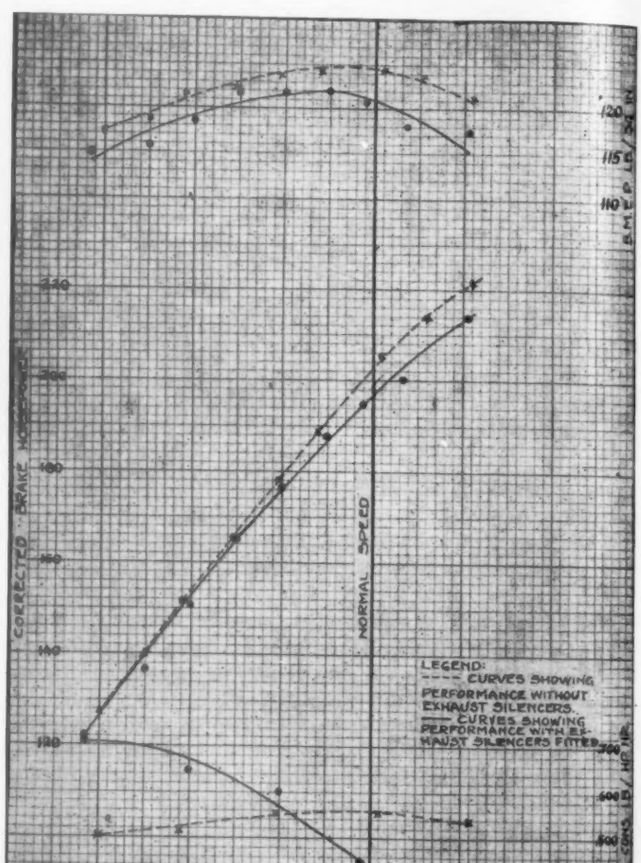
exhaust manifold equal to a two inch column of water. Each of the mufflers weighed approximately 10 lb. They were about 13 in. long and 7 in. in diameter at the maximum section. The Venturi opening was about 3 in. in diameter at the ends, the forward end being slightly smaller. The minimum section was 2¼ in. in diameter. The Army Air Corps made some tests with this type of muffler in 1923 at McCook Field,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Reproduction of curves showing full power B.M.E.P. and specific fuel consumption of a Wright model "E" engine operating with and without exhaust silencer.

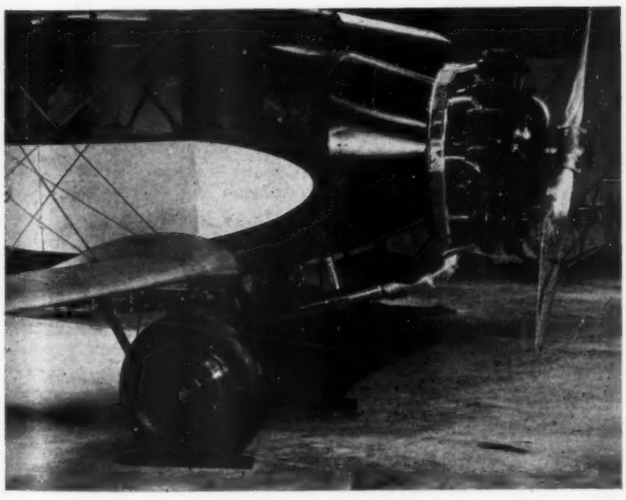
Dayton, O. A Wright Model E engine was used with the muffler fitted to each bank of cylinders. The power loss was about 5 hp. at the rated speed of 1,800 r.p.m. This is equivalent to a decrease of about 30 r.p.m. The device silenced the engine so that the noise of the propeller, valve gear, etc., predominated.

Southern Airways, Inc., is in production on a muffler claimed to increase the power of the engine as well as to silence the exhaust noise to a point where it is negligible. No data is available, at this time, on the detailed construction of the device. It appears to have some sort of baffles to reduce the velocity of the gases, while a by-pass on the sides overcomes the differences in pressure. The gases enter the muffler through an opening about twice the diameter of that used for the exit of the gases. It is said to be so constructed that when the engine is started a vacuum is formed which draws the exhaust gases from the cylinders at a faster rate than normally, the tubes on the sides create this vacuum. It is also stated that the device does not overheat and that it increases the power of an OX-5 engine from 10 to 12 per cent. The weight is not given. William Werner von Falkenstein is the designer.

Another newly designed muffler, on which there is but little information, is one built by an engineer in Oslo, Norway. It is also stated to create a vacuum. It weighs 22 lb. and when installed on a "Kaje" machine, it is claimed that the speed of the engine, which is normally 1400 r.p.m., is reduced by 20 or slightly over one per cent.

The general tendency in the installations of exhaust systems is to have an exhaust below the fuselage. This is due to the increasing use of cabin heaters and the desire to keep the exhaust flames out of view and to carry the exhaust noises as far from the cabin as possible. A muffling end on this pipe would decrease the noise to a minimum and eliminate the flame. When the engine is running at cruising speed, the noise of the propeller and the engine parts is not as bad as at full throttle. It has been found that some mufflers silence the exhaust appreciably and cause little loss of power at cruising speed but that at full power the noise reduction is practically negligible. This might suggest the use of a by-pass, so that when full power is desired the muffler could be eliminated. However, this tends to complicate the installation more than seems necessary.

It appears that the ultimate muffler will be of the Venturi type or long exhaust pipe type fitted with special ends. (These seem to be the only types which silence the engines sufficiently to warrant their use.) The resistance of the long exhaust pipe is slight when compared with that of the Venturi. It is true that the Venturi type can increase the speed of the engine but this power is absorbed from the airstream and therefore whether or not it does increase the overall efficiency of the installation is questionable. The decrease in pressure in the exhaust manifold increases the rate of exit of the exhaust gases appreciably with a similar increase in power. It is possible to design this type so that it has less air resistance than the R.B. or the Loening mufflers; the



Showing the long tapering type of exhaust manifold with side opening fitted on a "Whirlwind" engine in a Buhl "Airsedan".

Dayton Wright type of Venturi, tested by the Army and by Fairchild, is a step in this direction. It seems that these test units were too small and therefore caused a decrease in power. Though the Venturi type is more complicated and in some cases heavier than the long exhaust with a special end, it seems to reduce the noise more efficiently. However, too little experimental work has been done to draw any definite conclusions as to the most efficient type of muffler. This applies especially to the type of end for the long exhaust pipe. Most installations, made to date, have been quite crude and, to the writer's knowledge, no thorough tests have ever been made along these lines.

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of many aeronautical engineers and it is expected before long that the commercial passenger plane with a roaring engine will be a thing of the past. There seems to be little hope of total elimination of the noise of the propeller. However, cabin designs are being worked out with more consideration for the comfort of the passengers and noise is being reduced either by silencing the exhaust or by proper proportioning of the size and location of windows to the insulation in the walls of the cabin.

Aircraft Radio Beacon Development

Continued from page 1765

be equipped with suitable radio receiving sets, including visual indicators, so that practical flying tests by these air mail contractors may be carried out. Much valuable information is expected to result from these service flights, not only on the beacon operation but also on the practical handling of weather broadcasts to aircraft in flight.

The beacons operate in the frequency band 285 to 315 kc., and the telephone stations in the band of 315 to 350 kc. These are allocated to air service by the 1927 International Radio Convention. For the present the beacons are adjusted to the frequency of 290 kc., and the telephone stations to 333 kc.

The Bureau's work of the past year or so has been largely directed to the effort to replace the aural method by a practical visual method. The use of telephone receivers and determination of location by distinguishing certain aural signals requires skill and entails a certain strain upon the pilot. This would be eliminated if a method could be devised which required no listening but only an occasional glance at the instrument board.

The Army engineers worked out a visual system in 1925, which superposed an arrangement of relays and lights on the interlocking signal beacon. This was not found to be practical under flight conditions.

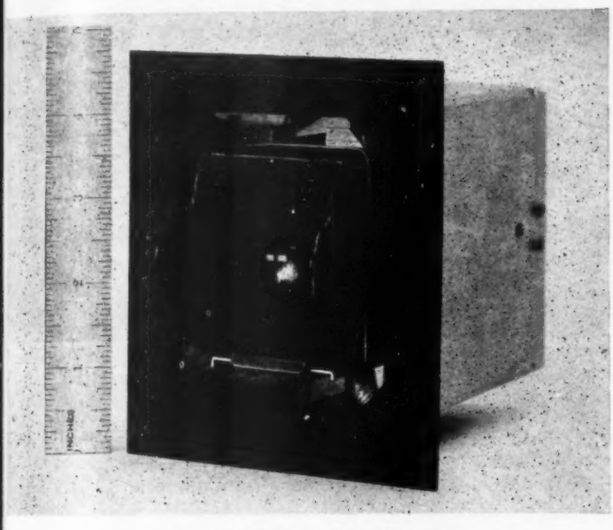
The Bureau of Standards has experimented with a number of possible visual indicator systems, most of them involving the use of two different modulating frequencies for the two crossed loop antennae. The modulated radio frequency is on the antennae continuously, instead of throwing from one to the other antenna as in the aural system. This permits the use of continuously indicating instruments on the airplane. If the airplane gets off to one side of the course, the intensity of one of the modulated waves will increase and the other decrease, owing to the directive nature of the two coil antennae.

It is required that a device be used in connection with the receiving set on the airplane which will give a visual indication of the relative amounts of the two modulated waves received. This requires some form of tuning to these two modulation frequencies. In several devices tried, the tuning was secured by means of tuned circuits attached to the output of the receiving set. Modulation frequencies of 500 and 1000 cycles were used.

One form of indicator consisted of a pair of neon glow lamps. One of these was in each tuned circuit. They were so adjusted as to just light up when the airplane was on the course and they received equal voltage. Because of their critical response voltage, they gave a rather sharp indication when the voltage of either tuned circuit dropped. In another form of indicator the two toned circuits were connected differentially to a rectifier and direct-current galvanometer. When the airplane was on the course and the currents the same in the two tuned circuits, the d.c. outputs balanced and the galvanometer needle remained in the center of the scale. For deviation to either side the galvanometer needle moved

correspondingly. These forms of indicator were found too critical and too complicated for practical use.

The form most recently developed, which is likely to be adopted, consists of two vibrating steel reeds. Their vibration gives the visual indication and they themselves provide the necessary tuning to the two modulation frequencies. The indicator is very simple and practical, merely being connected to the receiving set in place of telephone receivers. When the beacon signal is received the two reeds vibrate. The tips of the reeds are white, with a dark background behind them, so that when vibrating they appear as a vertical white line. The reed on the pilot's left is tuned to a frequency of 85 cycles and the one on the right to 65 cycles. It is only necessary for the pilot to watch the two white lines produced



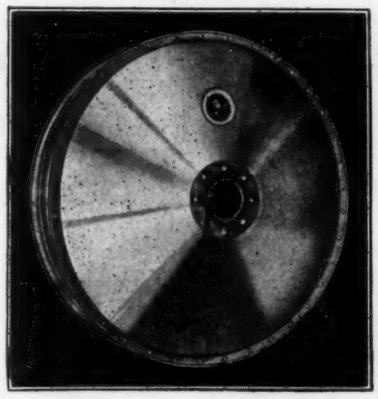
A vibrating reed indicator.

by the vibrating reeds. If they are equal in length, he is on his correct course. If the one on his right becomes longer than the other, the airplane has drifted off the course to the right (into the region where there is more of the 65 cycles). If he drifts off the course to the left, the white line on the left becomes longer.

The directive radio beacon station is usually located at an airport, just off the landing field. It employs two loop antennae crossed at an angle of 90 deg. with each other. Each of these emits a set of waves which is a maximum in its plane and a minimum at right angles thereto. Both antennae transmit 290-kilocycle waves but modulated at two different frequencies. A master oscillator producing 290-kilocycle current feeds two power amplifiers. These are modulated by two different low frequencies. Their outputs go separately to the two loop antennae.

Fig. 1 is a circuit diagram of the transmitter in simplified form. The two loop antennae terminate in tuning condensers and coils as shown. They are both tuned to 290 kc., and so adjusted that there is no coupling between them. The coils are coupled to the plate circuits of the two 1000-watt amplifiers. The plate circuits are untuned, which reduces intercoupling between the two tuned loop antennae through the plate circuits of the power amplifiers. A radio-frequency voltage is supplied to the grids of the two amplifiers from the 50-watt oscillator operating at 290 kc. with direct voltage (not shown) applied to the plates.

The plates of the amplifier tubes are supplied with high-voltage alternating current through transformers, one being connected to a source of 85-cycle voltage and the other to a source of 65-cycle voltage. These are the two modulation frequencies, to which the reeds of the visual indicator are tuned. Each power amplifier passes radio-frequency current



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every alternate half cycle, the frequency being 85 or 65 cycles. This occurs each time the plate is positive. The completely modulated output from one amplifier supplies power to one of the antennae only, and the other amplifier supplies only the other antenna.

The use of a common master oscillator prevents any shift in the indicated course due to tuning of the receiving set,

Interior view of a beacon transmitting station.

which might occur if two master oscillators were used in case they differed slightly in frequency.

As mentioned, the description is illustrative only. In practice means must be provided to prevent the production of harmonics, which are not permissible.

A number of other methods for modulating the carrier frequency at the low frequencies required are possible and have been used. The method just described involves the supplying of plate power directly to the amplifier tubes at the low frequencies desired. This method was not found entirely practicable because the constancy of the low frequencies depends upon the steadiness of the frequency of the power source available, which in most cases varies somewhat. Even with a steady source available, alternators with synchronous motors of special design to drive them would be necessary.

Vacuum tube oscillators controlled by tuning forks which supply sufficient voltage to enable grid or plate modulation of intermediate amplifiers have been developed, and solve the difficulty of keeping the low frequencies steady. In the grid modulation method the modulating frequency is impressed upon the grid of one of the amplifier tubes. With the plate modulation method the low-frequency voltage is applied to the grids of modulating tubes, the plates of which are connected to the output of one of the amplifiers in a circuit arrangement analagous to that of the ordinary method of plate modulation employed in broadcasting stations. Both methods give satisfactory performance although the plate modulation scheme has some advantage in that less distortion of the wave form is introduced.

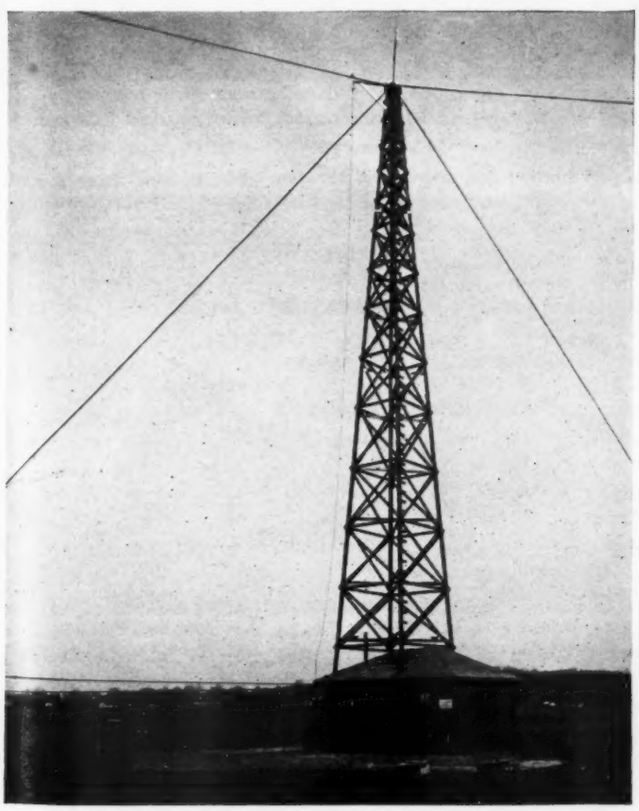
When the beacon is to be used for air routes in several directions, a goniometer, not shown in Fig. 1, must be introduced. This is a coupling arrangement connected between the antennae and the amplifiers, rotation of which is equivalent to rotating the antennae. The goniometer designed for use with this apparatus is shown in Fig. 2. It has two pairs of coils, each pair consisting of an 8-turn rotor and a 32-turn stator. The stator coils are fixed at right angles to each other, and so are the rotors. Rotation of the rotor coils with respect to the stators orients the course marked out by the beacon in any desired direction. At airports where several

courses intersect the beacon course can be set successively on the several courses for fixed time intervals.

The beacon can be used with any receiving set which operates at the frequencies used, merely replacing the telephone receivers by the simple reed indicator unit. There are however a number of special conditions involved in receiving on an airplane, and the Bureau has developed special receiving sets in order to use the beacon system under the most advantageous conditions.

The use of a trailing wire as an antenna has long been recognized as a source of difficulty in airplane reception. Besides its obvious inconvenience and possible dangers, it is particularly unsuitable to radio beacon reception because it has a directional effect introducing apparent variation of the course and making it more difficult for a pilot to utilize the beacon signals. The trailing wire has been eliminated through the development of a receiving set having the necessary sensitivity and other characteristics necessary to receive on a short antenna through the ignition interference. The antenna now used is a metal pole extending vertically from the cockpit, having a total length of 10 ft. It has numerous advantages, not the least being that it practically eliminates direction errors in the beacon course which have been observed at night.

The receiving set weighs less than 15 lb.; its power supply is a 6-volt battery weighing 15 lb. The receiving set operates



Radio beacon tower at College Park, Md.

in the frequency range from 285 to 350 kc. A circuit diagram is given in Fig. 3. It is used to receive either the beacon signals or radio telephone or telegraph messages at will. It is highly selective as well as sensitive, and is provided with interstage shielding as well as shielding against extraneous interference. The selectivity of the set design is supplemented by the great selectivity of the reed vibrators, which help greatly in reducing interference. It uses 3-volt tubes, selected for freedom from microphonic noises. The set

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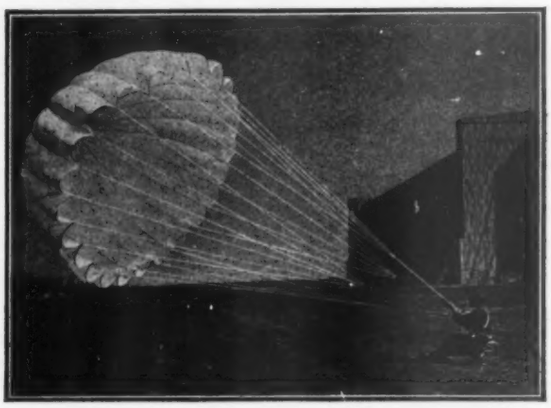

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has remote control arrangements for tuning and volume, so that the set itself can be out of the way in the tail of the airplane.

The indicator for the beacon signals is mounted on the instrument board in front of the pilot. It functions essentially the same as a telephone receiver except that its vibrating portions are tuned while a telephone receiver responds almost equally to all frequencies. The indicator consists of a set of coils through which passes the audio output current of the receiving set, acting on a pair of short steel strips or reeds. These two reeds are tuned to the two modulation frequencies

Airplane instrument board showing vibrating reed indicator.

of the beacon signals. When the two are received with equal intensity the two reeds vibrate with equal amplitude. Their vibration is made evident by the motion of white tabs on their ends. These tabs are all that the pilot sees of the instrument, apparently lengthening out into white lines against a dark background when the indicator is in operation. By piloting the airplane so that the two lines are always of equal length, he remains on the indicated course.

While there are no commercial receiving sets at present available which are suitable for use on aircraft at the new frequencies for the air services, close cooperation is being maintained between the Bureau and several commercial companies working on various problems related to radio aids for air navigation. It appears that suitable receiving sets and auxiliaries will soon be offered on the market.

The directive beacons at College Park, Md., and Bellefonte, Pa., operate on 1 kw. Such beacons, located about 200 mi. apart, would give satisfactory beacon service when the course usually flown is practically a straight line between them. Where the course varies in direction, lower power beacons at the turning points could be used. Where the course is straight for a considerable distance such as 200 mi., it is planned to utilize a supplementary feature called "marker beacons." The directive beacons successfully guide a pilot along the course but give him no information of the distance traversed along it. This lack is supplied through the installation of non-directive beacons, placed along the airway at short intervals (perhaps 25 mi.). These marker beacons are of very low power (a few watts), and emit a characteristic signal which the airplane pilot will receive for one or two minutes. They tell the pilot when he is passing over a specified place, so that he can locate himself and always know his position. In fact through keeping track of these marker beacons, the pilot will be able to gauge wind conditions and note any change in direction or velocity as he proceeds during

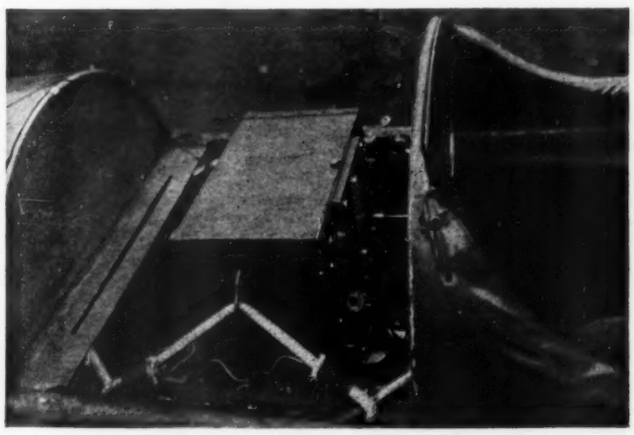
flight. The marker beacons operate a 60-cycle reed vibrator mounted alongside the directive beacon indicator on the airplane's instrument board. Each marker beacon will send the characteristic signal assigned for its location, which will coincide where possible with the characteristic flash signal of the light beacon at the same location. Thus the marker beacon signals will come to the pilot in a logical and automatic manner.

The reed indicator can also be used to transmit messages to the pilot when necessary, merely by interrupting the transmitting current at a slow rate in accordance with a code understood by the pilot. Additional reeds, tuned to other frequencies, can be used if desired to send special information.

The audio-frequency tuning of the reed vibrators also helps to avoid interference between the directive beacons. When one beacon station uses modulating frequencies of 65 and 85, the next station could use 75 and 95, etc. Indicators consisting of several pairs of reeds are easily installed on the instrument board of an airplane.

Flights have been made under practical conditions up to 135 mi., in which the beacon signals actually determined the course. Parts of these flights were made under conditions of low visibility, when the pilot had only the beacon indicator to determine his direction. To a large extent the device is unaffected by interference. It is affected little by airplane engine ignition interference. Such interfernce does not change the operating characteristic of the indicator signal, but merely reduces the distance range from the beacon station. The system was recently demonstrated to various prominent Government officials.

This development insures the full success of the Department of Commerce program of aids to air navigation. It is the intention of the Department to establish radio telephone and



Special receiving set mounted back of the cockpits of a plane.

radio beacon stations along the civil airways throughout the country, probably at the principal airports. To utilize both services, airplane operating companies will require only to provide a moderate amount of engine ignition shielding and to install a very simple radio receiving set on each of their airplanes.

Opinion recently expressed by the leading aviators converges on the necessity of a course indicator that will guide airplanes in conditions of low visibility. The radio beacon provides this, and when the Department of Commerce has completed its development and established the system over the country, airplanes in flight will always have the beacon signals available to keep them constantly informed of their location. Indeed, when a pilot leaves his regular course either accidentally or to avoid a stormy area, the radio beacon will show him the way back.

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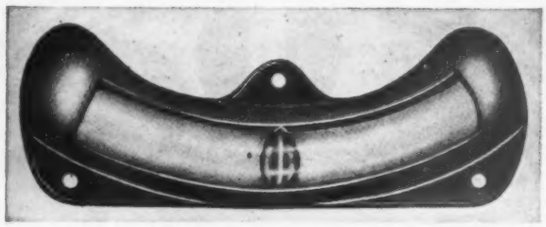

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FOREIGN NEWS

By Special Arrangement with the Transportation Division Bureau of Foreign and Domestic Commerce

Greenland Air Station Planned

A report from Denmark states that definite plans have been made to establish an aeronautical supply station at South Stroemfjord on the the southwest coast of Greenland. Arrangements for the base have been made by Helge Bangsted, Danish explorer, says *Politiken*, a Copenhagen newspaper.

Such a station would be available for use by Bert Hassel on his proposed flight from Chicago to Stockholm in July. Should a regular trans-Atlantic air service be developed with a route touching Greenland and Iceland, this base would serve as an important stop.

To Operate Glasgow-Belfast Service

A company has been formed in Glasgow, Scotland, under the title of the Aerial Taxis Co. This organization plans to inaugurate regular daily airplane service between Glasgow and Belfast in June. Large planes capable of accommodating from 12 to 20 passengers are to be used, the officials state.

No Swiss Civil Air Accidents in 1927

A recent report discloses that no accidents occurred in the Swiss civil aviation service in 1927. On Jan. 1, 1928 there were 35 civil planes in Switzerland, which in 1927 made 7,608 flights in 3,908 flying hours.

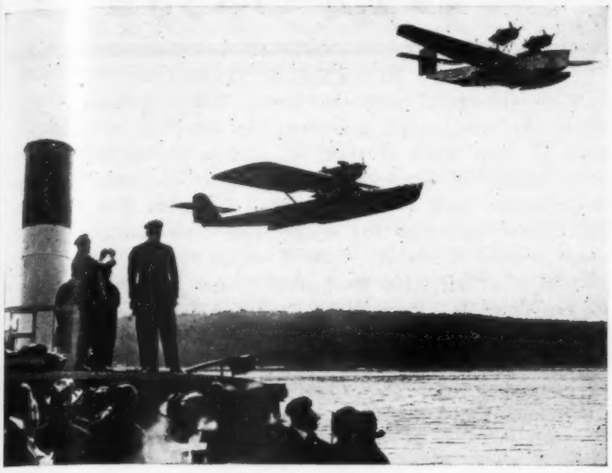
Montreal Club to Hold Show July 6-15

The Montreal Light Airplane Club will hold its first annual exposition the week of July 6-15. The Dominion Government has granted free use of its airport to exhibition visitors arriving by air.

Honored

A. V. Roe, Avro plane manufacturer and aeronautical pioneer, who was recently honored by the British flying world on the twentieth anniversary of his first flight made June 8, 1908, following numerous glider experiments. Roe was the first Englishman to fly over British soil.

"Superwal" and "Rocco"



Germany's two giant flying boats, the Dornier "Superwal" (left) and the Rohrback "Rocco" shown during tests at Wannsee. The "Superwal" accommodates 21 passengers with two pilots, a mechanic, and radio operator bringing the total to 25; the "Rocco" carries 10 passengers. Each of the planes is powered with two engines—Rolls-Royce 650 hp. Condors.

Brisbane Company Reports Operations

Report for the first year of operation recently issued by the Brisbane, Australia, Flying School shows a total of 1,599 pleasure hop and taxi passengers, with 36,284 mi. flown in 5,086 flights totalling 615 hr. in the air. A number of students were trained by the school for private licenses. The staff of the concern comprises a manager instructor, ground engineer, and 14 pilot members.

The whole of the company's work was carried out with two Moth planes fitted with Mark II Cirrus engines. Visits to Sydney, Grafton, Warwick, Toowoomba, Pittsworth, Camooweal, Emerald, Rockhampton, and Bundaberg were among the taxi trips made. But one accident was reported for the year, this only entailing damage to undercarriage and bottom longerons.

Brazil Aero Congress Opens July 14

Brazil's first national aviation congress will be held at Rio de Janeiro from July 14 to August 8 this year, it is reported. An international aeronautical exposition is planned to be held at the same time. Among topics to be considered by the congress are land organizations, aerial traffic, aeronautical technique, rights, and the administrative organization of national aeronautics.

Oxford-Cambridge Air Meet Planned

An inter-varsity air meet is being planned by the Oxford and Cambridge air squadrons for the spring of 1929. Tests of airmanship rather than races will be the nature of the first competition, it is said. The English college fliers are hoping that an international air meet between universities of the United States and England may be eventually realized.

Honduras Air Mail to Save Four Days

An arrangement with the Tela Railroad Co. was recently completed by the Government of Honduras whereby the Tela company will engage in air mail transport service between Tegucigalpa, the capital, and the north coast. Mail delivery time, it is said, will be shortened by four days or more with this arrangement.

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SIDE SLIPS

By ROBERT R. OSBORN

With successful airplane flights being completed every other day now, to all points of the compass, it certainly is hard to keep track of them all and to decide what will be news worthy of comment ten days after it leaves this typewriter. We used to think it was a mighty fine job to be the official welcomer for a city like New York, but we've come to the conclusion that it might not be all beer and skittles after all. He must have to get up early every day to run down the river in the police boat to meet all of the incoming steamers, make the same old speeches and hand out the keys to the city, then sit through the same barrage of telephone books, ticker tape and newspapers during the parade up the Avenue.

When you get down to it, New York city is contributing quite a bit to aviation too. There's the great expense of keys and leather citation rolls and medals. Then there are all of those Packard cars running up and down the Avenue most of the time and the entire snow-shoveling gang out to keep the streets clear of paper. Then all of the fire-boats in the harbor have to be anchored down near the Statue of Liberty with the official water salute running night and day. We'd like to make the suggestion that the next six parades be cancelled and the money used to fix up an airport.

• • • •

There was quite a laugh in the New York papers the other day when someone suggested that the name of the town be printed in large letters on the roofs of the buildings for the guidance of visiting fliers. The laughter was because the city is so easy to identify from the air,—it is about the only large city in the country without a decent airport within reasonable distance from the business district.

• • • •

As some readers may not have seen the announcement in the newspapers a while ago, we think it well to mention that the offer to buy a paint brush for any town which will paint its name on a prominent roof is still open. The contributor is the esteemed Will Rogers, the self made diplomat, ambassador without a portfolio, and aviation attache extraordinary.

• • • •

"POLISH AVIATORS MAKE 40 HOUR TEST FLIGHT" Headline.

When they get through with the preliminaries, we can be on the look-out for real news. This reminds us of the statement of Roger Williams, after he and Chamberlin had failed by an hour to set an endurance record, that their fifty one hour flight had been a preliminary test to see if they could get along together for any great lengths of time.

• • • •

"DEANS BAN YALE FLYING WITHOUT SPECIAL PERMIT" Headline

Who remembers the good old preparatory school days when we weren't allowed to play football without a letter from father?

• • • •

The recent introduction of aeronautical golf at Curtiss Field on Long Island, has already developed the usual golf alibis. In aeronautical golf, you know, two players fly over the course and try to drop the balls as close to the cup as possible, and their partners on the ground finish holing out in the usual way. The pilot member of the first defeated team said that his difficulty was the control stick in his plane was too long, interfering with his follow-through.

AIRPORTS AND AIRWAYS

Houston, Tex.

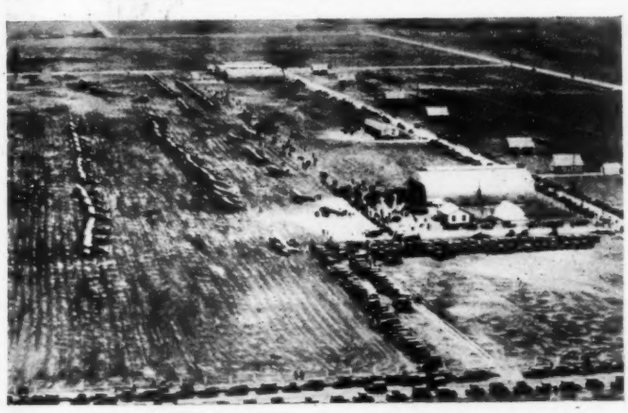
By Pat McNealy

Visitors to the National Democratic Convention at Houston starting June 24 will have placed at their disposal more than 30 airplanes, according to a recent announcement of Heywood Nelms, director of the airport corporation.

With a committee personnel of more than 300 to complete arrangements for the national parley, directors of the airport are assisting the entertainment committee by making arrangements for the entire delegation to inspect the new $200,000 airport constructed about nine miles southeast of the city.

Small planes, especially fitted for photographers to make aerial views, and cabin jobs, which will be ready to fly on a moment's notice to dispatch special news and pictures for the various agencies that will be working on the national meeting, will be located on the field at all times.

Special arrangements have been made to take care of the fleet of ten cabin planes that will bring the official Wisconsin



A view of the Houston Municipal Airport during its recent dedication.

delegation to the parley. Although this is the only group signifying definitely that they were coming by air, it is expected that others will wing their way to the convention, and the management announces there will be plenty of room to house all visiting planes.

There are agencies for the Stinson-Detroiter, Waco, Travel Air, and Swallow planes at Houston. Planes are operated by a number of local business men for business as well as private use. A number of these planes are housed at the Houston Municipal Airport.

Orlando, Fla.

By R. T. Bly

Convenient access to the city is the outstanding feature of the new Orlando, Fla. Municipal Airport which is expected to open for use some time in July.

This field is probably to be slated as one of the intermediate points on the Atlanta, Key West mail route, under contract to Pitcairn Aviation, Inc.

The site was selected and the plans were made by the Airport Committee—L. M. Autrey, Mayor of Orlando; E. C. Nilson, president, Orlando Airlines, Inc.; and Morton Macartney, city Engineer.

The city is now taking bids from local contractors for construction of a hangar 80 by 100 ft., large enough to accommodate three of the largest tri-engined planes used in the air mail service as well as a number of smaller craft.

Specifications for the hangar which is to be of standard type call for steel and concrete fire proof construction, concrete floor, plumbing facilities and electric lighting. There will be sleeping quarters for the keeper. Anticipated cost is $7,500. to $10,000. Bids close June 13.

A small auxiliary power plant building is to be erected close to the hangar with foundation sturdy enough to support the 61 ft. beacon tower to be erected when the field is lighted. The beacon planned will have a visibility of 18 mi. It will probably be a 10 sec. revolving white light.

There is an eight million candle power General Electric, 60 sec., revolving white beacon already operating in Orlando atop the 10 story State Bank Bldg. in the center of the city. The Bank intends to continue its operation indefinitely. Even after the municipal beacon is erected, this private beacon will be very useful as a range light to check compasses, establish drift, etc. Flood lights will be installed and boundary lights will be mounted on the steel fence posts already placed.

The airplane runways which are cleared, leveled, and planted in grass are each 500 ft. wide. The north and south runway is 2600 ft. and the east and west 2500. The city dredge is being moved to the north of the lake to pump more sand into the far end of the east and west runway which is smooth but low.

Salt Lake City, Utah

By E. E. Hale

Ten Hornet powered planes are now stationed at Salt Lake for the Boeing Air Transport mountain division's air mail route, Salt Lake to Cheyenne. As rapidly as the planes can be re-engined at Seattle, the company is adding to the number until 16 will be on the run, vice president Edward Hubbard announces. Pilots find the extra power "a joy forever" carrying the heavy mail loads over the mountains. Hubbard also announces the company's six new 12 passenger tri-Wasp planes will be in service between San Francisco and Chicago about July 1. They are to be sesquiplanes, planes with the short under wing. Through a method worked out at the Seattle factory these planes will be practically noiseless for the passengers.

Two families in the far-flung mountain region out this way are getting their reading matter—newspapers—by plane daily. They keep watch at emergency landing fields among the peaks and each morning are out on watch for the pilot to drop the *Salt Lake Tribune*. One is 40 mi. east of here in the Wasatch Range, the other lives on the Utah-Idaho border 50 mi. to the north. Foggy, stormy days they don't like, for then they often miss their papers because the planes do not fly or the pilots get out of range, finding their way over the dangerous area.

Had Dawn-to-Dusk Flier Worried

Lieut. Russell L. Maughan, dawn-to-dusk flier, thought he would be minus a perfectly new P-T training plane recently. About dusk, Tommy Thompson, veteran barnstormer of Salt Lake and Earl Vance of the same school of Butte wanted a few minutes air credit, so they took off with both sticks working. Both Thompson and Vance can just about make a plane fly backwards. But oh, what a landing! Maughan covered his face with his hands and moaned, while others on

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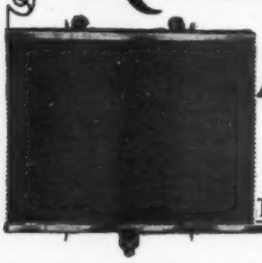

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the field took the view the boys were just showing off. The doughty Army plane bumped and bounced and rolled, but kept its feet—or rather landing gear. So far there has been no great rush for double stick landings.

The new 90 by 120 hangar for the National Parks Airways, Inc., operator of the air mail route beginning July 1 Great Falls to Salt Lake, is about ready for occupancy here. The hangar will house the Fokker Super-Universals the company will operate. In addition to the hangar the building has commodious offices, waiting rooms, shops, pilots' room and is equipped with modern conveniences.

Grand Rapids, Mich.

The Grand Rapids Airport, municipal field located four miles south of the heart of the City of Grand Rapids on county owned property, is maintained by the Grand Rapids Flying Club.

The past few months have seen a considerable amount of improvement under way at the airport, chief among which has been an expenditure of $5,000 in lengthening and smoothing a runway, and the construction of a new runway north and south. This gives the airport two runways approximately 3,000 ft. long and one runway approximately 2,000 ft. long, all of which are 300 ft. wide.

An old house, building, and barn are being removed, and a sum of $5,000 is being spent in the construction of a concrete oval from the entrance gate into the field, for the parking of automobiles.

Jack Byrne, local distributor for Western Michigan of Stinson Aircraft, is constructing a $20,000 steel and concrete hangar 60 by 110 ft. in size containing a concrete floor, wash rack, shower baths, emergency sleeping quarters, and repair facilities equal to the finest.

A pump and tank and pit are being constructed in front of the hangar and Byrne is to take over the distribution of Stanolind Aviation Gasoline and Stanolind and Superla Aero Oils.

A number of tree stumps and other hazards on the field are to be removed and the city, at the present time, is considering the installation of beacon and flood lights.

Jack Byrne recently secured delivery of a six passenger Stinson monoplane and is very much pleased with the same.

A Stinson monoplane belonging to the Thompson Aeronautical Corp. of Cleveland, O., successful bidders on the United States Mail Route for Michigan, was in Grand Rapids recently looking over the field, in preparation to starting air mail service by not later than July 1.

Detroit, Mich.

By John T. Nevill

Following appropriate ceremonies Pilot Daniel E. Lindsey, of National Air Transport, recently took off with the first Detroit to Toledo mail over the Detroit-Toledo shuttle line to the transcontinental air mail route. The new service is designed to give Detroit mail, posted here up until 9:15 P. M., forenoon delivery in a number of eastern and midwestern cities. On their Detroit-Toledo line, the N.A.T. will use a Pitcairn Mailwing.

C. C. Hyatt, Detroit manufacturer, and member of the Wise Birds, recently returned from an extended air tour of the East, made in the Wise Birds' Stinson biplane. Mr. and Mrs. E. H. Watson of Flint, nephew and niece of Mr. Hyatt, accompanied him on the trip. Jack Price was the pilot.

Detroit's newest aviation organization, the German-American Flying Club, of which Baron Ehrenfried Guenther von Huenefeld, Maj. James Fitzmaurice, and Capt. Herman Koehl, crew of the Bremen, are honorary members, recently

held its second meeting at the Fort Shelby Hotel. Henry Hansen, president of the new club, flew with Captain Koehl in the German air service, during the World War. The club was organized during the Bremen crew's visit in Detroit.

Lieuts. Clarence W. Hudson and Hoyt L. Prindle, Selfridge Field fliers, recently were rescued from drowning by a former Ziegfield Follies actress and her husband, after the officers' catboat overturned in Anchor Bay, near Mt. Clemens. Hudson and Prindle were clinging to the catboat, when Myra Brown, the actress, and her husband, the proprietor of a hotel near Mt. Clemens, observed them. The rescuers towed the catboat to Selfridge Field.

Wichita, Kan.

By S. B. Kiefner

Wichita has just been selected as one of the government airport depots. Word to this effect has been received by V. M. Hamilton from C. H. McBrayer at Washington, D. C.

Wichita will be one of the 12 airport depots in the United States, each to serve as a distributing point for aerial freight. The depots will be on through air mail and freight routes and will connect with a number of feeder lines. Selection of Wichita as a division point on the New York to Los Angeles plane and train route is said to have been instrumental in determining Wichita as the logical city for the air freight depot.

All officers of the Wichita Flying Club, one of the most active aeronautical organizations of the West, were re-elected at the annual meeting of the club. They are: J. H. Turner, president; Howard Fleeson, vice president, and Roscoe Vaughan, secretary-treasurer. The club, which handled most of the national aeronautical events here during the past year, will entertain the personnel of the National Air Tour here on July 2. Club members will handle the tour affairs in Wichita.

Three new Stearman biplanes have left Wichita for New York. Eric W. Wood, Harvard graduate, who supervised construction of his plane, was one of the pilots to wing eastward. A second Stearman plane went to the New York agency to join eight other Stearmans at Curtiss Field. The third was sold to a Canadian dealer and will be delivered at Montreal.

St. Paul, Minn.

By H. A. Lindbergh

The grounds at the St. Paul Municipal Airport are being leveled and filled in wherever required and since extensive developments are being made, this field will be in first class condition when the proposed improvements are being completed. The words "Saint Paul" are imbedded in the cement surfaced apron extending for some distance in front of and to the sides of the brick and steel hangar. The concrete road, now under construction, will connect with this cement way adjacent to the hangar so entry to the field by car will be possible during all kinds of weather. F. J. Geng, the airport master, has two assistants, Harold Burns and P. E. Demoure.

Tom Lane, who was a passenger with Speed Holman during his winning of the Class A New York to Spokane air derby during the past year, is now flying Anderson's Waco from the St. Paul airport. G. A. MacDonald is giving instructions on a Swallow to the students of the Air Service, Inc. of Minneapolis. The Aero Industries, Inc., the Minnesota and North Dakota distributor of the Pheasant, has a demonstrator at the field to carry on their activities.

H. L. Rothschild, secretary of the Roth-Downs Airways, Inc. and Leon Dahlem, the chief pilot, will make a promotion tour in Minnesota and the Dakotas in the Velie powered Monocoupe, for which they have the distributorship. This small enclosed cabin monoplane proved to be of pop-

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ular interest to the visitors at the Northwest Aircraft Show. The Driggs-Dart, for which the Roth-Downs also has the distributorship, was not available for the show, but one is expected within the near future. The activities of this organization are carried on at the Curtiss Field, which is nearby to the Minnesota State Fair grounds.

The "Modern Airplane", an interesting pocket size book on the theoretical and practical side of flying by B. W. Downs, president of the Roth-Downs Airways, is meeting with ready acceptance by the airminded public.

Minneapolis, Minn.

Fred Whittemore has been added to the staff of pilots with the Northwest Airways, Inc., the air mail, express and passenger operator between the Twin Cities and Chicago. Eddie Middagh, another air mail pilot, made a trip to the Superior, Wis., field in a Stinson-Detroiter with three passengers. Eddie was a former chief pilot with the Arrowhead Airways, who operate the only field at the Head of the Lakes with any hangar facilities.

The *Minneapolis Daily Star* is running interesting columns under the heading "Aviation News" with C. A. Young in charge. Items of local and national activities, such as would be of interest to the average newspaper reader are mentioned in the columns in non-technical language.

K. J. Dejuhasz, who has been one of the instructors in aeronautical engineering at the University of Minnesota, has left to join the staff at the Engineering Experiment Station at the State College in Pennsylvania. He very likely will specialize in high speed engine research work.

The Cities Service Oil Co. had on display at its booth at the recent Northwest Aircraft Show a cylinder from a Wright J4 engine with a record of 1168 hr. to its credit on the planes of the Northwest Airways. This organization is furnishing the Northwest Airways with gas and oil at the terminals and several stops en route on the air mail line.

Philadelphia, Penna.

R. Sanford Saltus, Jr., vice president of the Ludington Philadelphia Flying Service, announces that a third Fairchild cabin monoplane, equipped with a Wright Whirlwind engine, has been ordered from the Fairchild Airplane Manufacturing Corp., for service at the Philadelphia Airport. Two others are in service at the airport now. The Ludington company recently sold three others.

The purchasers are the Philadelphia Air Transport Co. of Norristown and Philadelphia, who, through J. Wesley Smith, president, ordered a Wright Whirlwind Fairchild cabin monoplane for its airport at Norristown; Brock and Weymouth, engineers and aerial mappers of 1607 Walnut St., Philadelphia, who ordered a Pratt & Whitney Wasp Fairchild cabin monoplane, and Pitcairn Aviation, Inc., operators of the New York-Atlanta air mail service, who ordered a Wright Whirlwind Fairchild cabin monoplane.

Since taking the Fairchild agency last winter the Ludington company has sold five of the cabin monoplanes and has purchased three for use at the airport.

Air Route Bureau Established

An Air Route Information Bureau has been added to the Touring Bureau of the Automobile Club of Philadelphia. Information is being given as to established air routes, time tables, schedules of regular passenger flights, locations of flying fields, and transportation to and from airports throughout this section. The service covers information regarding airports throughout the country and is being kept up to the minute for the convenience of prospective air travelers.

The Automobile Club also is boosting aviation here by painting the roof of the club building at 23 South 23rd St.,

with the word "Philadelphia", and a large white arrow that points in the direction of the Philadelphia Airport on Island Road below Tinicum Avenue.

The establishment of the Air Bureau and the lettering of the roof was adopted by directors of the Automobile Club at the instance of Hollinshead N. Taylor, vice president of the club, chairman of the Aviation Committee of the Philadelphia Chamber of Commerce, and a member of the Pennsylvania Aeronautics Commission.

New Castle, Penna.

Flying operations have been started at Jackson Field, three miles north of New Castle, by the Kegarise Air Transport. The company has the agency for Alexander Eaglerocks. Its airport is located on the main road between New Castle and Erie, Penna.

The location makes the field easily accessible and a natural slight grade from the east and west adds to the ease of take offs and landings. A hangar that can accommodate four airplanes has just been completed and there is ample space for the parking of automobiles.

Kegarise Air Transport is headed by R. R. Kegarise, who saw considerable service in the U. S. Flying Corps during the World War, and Lieut. H. C. Sherman, who has had three years of Army training and flying. The company is attracting considerable attention and public interest in this section, and reports a steadily increasing passenger business.

Lancaster, Penna.

J. P. Jones, local operations manager, recently spent a very pleasant and profitable week end at the opening ceremonies of the Endicott Field, Endicott, N. Y. Among the spoils with which he returned was a beautiful loving cup, for exhibition flying.

Rupert Herr, advanced flying student here, has purchased a Waco 10 from the Lancaster Airways, Inc.

Assistant Secretary of War Colonel Robins recently landed here in a Curtiss Falcon. He was accompanied by the Dutch Ambassador of the Netherlands in a Curtiss O-11.

Garden City, L. I., N. Y.

By M. Brown

Among the visiting planes and fliers at Curtiss Field on Memorial Day were Brock and Schlee, in their new Bellanca; Jack Price, who flew a Stinson from Detroit with three passengers; and Roger Q. Williams.

Roger Williams, Capt. Ceasare Sabelli, and Capt. Piero Bonelli will soon attempt to fly to Rome in the "Roma". They are staying at the Garden City Hotel until conditions are favorable for the flight. On Memorial Day the Roma was flown out over the Atlantic Ocean, and wreaths were dropped in honor of those aviators who sacrificed their lives.

Lieutenant Batlle recently soloed three students, Ivan Monroe, John Cook and E. E. Douglas. McMahon soloed George Gosoon on Memorial Day.

R. W. Brown, who has the agency for Travel Air, got delivery on four planes and immediately sold three, two to students, and one to the Roosevelt Flying School, which is doing so well that two more Travel Airs have been ordered for student instruction.

Many passenger flights are being made at Curtiss Field, and Stanley Young, shop manager, is seeing to it that all planes are made ready with their usual promptness. About 35 men are employed on the field and in the shop, among them "Red" Tobiason and Frank Pollard, well-known airplane mechanics who have been in the industry over 10 yr. Ted Esslinger, who was one of the first pilots in the country to obtain a pilot's license, continues to be lineman for the Curtiss training planes. It is largely due to his careful in-

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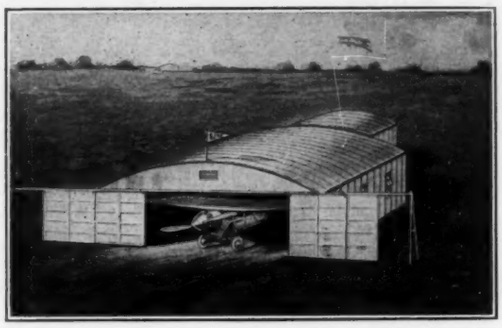

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Rene Fonck, French war ace, has been making frequent visits to Curtiss Field since returning from abroad. He is getting the Sikorsky "Ville de Paris" ready for its non-stop flight to California.

Armonk, N. Y.

Barrett Airways, operating at Barrett Field, has been very active in the last few weeks. A complete photographic department has been organized and much work is planned for the immediate future. Leo Terletsky, chief pilot, recently flew in from Wichita, Kan., with a Whirlwind Stearman biplane. Barrett Airways is now a sub-dealer for the Stearman Aircraft Corp. in Westchester County.

Much work has been done on Barrett Field and it is now nearing completion. The field has been graded and the runways are complete. At the end of each runway is a strip of crushed stone 10 ft. wide, whitewashed to mark the runway. The approaches to the field are being improved and all the trees in the vicinity are being cut down. The field has been harrowed and seeded. The new hangar is now complete and all the buildings have been painted. The roof of the field office has been marked "Barrett Field" in large letters. In White Plains, a few miles away, four indicators have been painted on rooftops pointing towards the field. On the roof of the Upperen Building is a large sign with the name of the town and an arrow indicating the direction of the field.

Four new students joined the flying school recently, bringing the number close to 20. The ground school course has been started with a session every Tuesday evening in the field office.

Spokane, Wash.

By E. Harve Partridge

Purchase of four new floodlights for the municipal field at Parkwater has been authorized by the Spokane city council. The cost will be $1275. The lights will be ready for use by June 20, according to plans. The 1927 national air races were flown over this field.

Notice that two contract forest patrol airplanes will be used in the Spokane area this summer has been received from Washington, D. C. Nick B. Mamer, manager of the Mamer Flying Service, said he will submit bids for flying the patrol. He has had charge of the work for the last three seasons when government planes were used.

Mamer recently flew a new Buhl Airsedan from the Michigan factory to Tacoma, where he made delivery to the Story Flying Service. He sold a similar plane to the Northwest Mines Development Co. for use of Sam Wilson, company president. Mamer utilizes one Airsedan in his own operations. He has the Northwest agency for Buhls.

Preparations are being made by Spokane fliers and air enthusiasts for entertainment of the National Air Tour visitors on July 23, the date tentatively set for the arrival here of the aerial caravan.

Augusta, Ga.

By Frank W. Hulse

The lights on Daniel Field were recently turned on for the first time. M. A. C. Johnson, local flier, had the honor to be the first one to fly by the lights. Soon after he landed Harry Rogers, who was stopping at Augusta on his way from Florida to New York, took up several of the city officials in his Fairchild monoplane. The lighting system consists of a 15,000,000 candlepower floodlight, obstruction lights on a power line about a quarter of a mile from the field, hangar lights, and a 40 mi. beacon which is on the Forrest Hills-Ricker Hotel near the field. All of the equipment is General Electric. The beacon burns all night and the other lights are turned on when a plane is heard. The city has appointed a

special officer to stay on the field all night to take care of the lights.

One of the local oil companies has a special pump mounted on a truck in order to give quick service to all planes that come in.

All planes going from the East to Florida are invited to come by Augusta. This route is about 150 mi. shorter than by Atlanta.

Boston, Mass.

By Daniel Rochford

Boston Airport Corp. has ordered a Ford plane to be used locally. Gen. Mgr. B. F. Billings went to Detroit and made the deposit and stated that he is promised September delivery. The corporation is expanding its operations and expects to announce shortly the discontinuance of all instruction on OX engined planes and the adoption of Wright Whirlwinds as standard equipment. The present students will be completed on the OX planes on hand. The new student rate will be moved up from the present $300 for 10 hr. to probably $45 per hour.

Crocker Snow of Skyways, Inc., flew a new Stearman Whirlwind engined biplane to Boston recently. The local pilots flew the plane and praised it highly. Skyways now handles Challengers, Stearman planes, and expects soon to have a half dozen Monocoupes.

Dennison Airport Corp. has affected an agreement with Skyways by which they will distribute the Monocoupes south of Boston and Skyways will distribute to the north. A mutual arrangement covering Wacos and Challengers has also been effected. L & H of Hartford hold the basic Monocoupe agency here.

Sumner Sewall, traffic manager for Colonial Air Transport, Inc., at Boston, war-time ace, soloed and took his private Department of Commerce license at the Westfield Air Meet recently and is going west to take delivery on and fly back a Monocoupe for his personal use at Boston. He expects to use it flying about New England this summer booming air mail.

Steubenville, O.

During a recent week the new municipal airport was dedicated by officials of the city of Steubenville, the Gates Flying Circus being on hand to give many people their first ride. The crowd was estimated at 15,000, and 2,455 passengers were carried by the Gates planes and the Tri-State Flying Service, owner of the field. Fort Steuben Field, as it is called, is located directly alongside the first Ohio River dam below Steubenville, and is seven miles from the center of town. The approaches from north and south are very good, open country extending for at least a mile either way. The field itself has 30 acres, which will all be available for landing upon completion of some grading and a small fill. This will give Steubenville a real airport and all visitors will be taken care of satisfactorily, gas and oil service being on the field and hangar space for three planes. The Tri-State Flying Service, headed by J. S. Moore and Lieut. L. H. Chase, have the distribution for Waco planes in Eastern Ohio and operate a school of instruction. They are flying a Waco 10 and a Canuck. One student has purchased a new plane.

Cincinnati, O.

By Harold Norman Loeb

John W. Cowell, attorney, is the new president of the Cincinnati Aero Club, succeeding A. N. Cooper. Other officers chosen at a recent meeting were: Frank M. Fairchild, vice president; Gene Eichbold, treasurer; Miss Fay Brown, secretary; and James Welsch, James Poland, Edward Stinson, Charles Schaupp, Edward Thompson, and John E. Shaw, directors. The new president was presented with a

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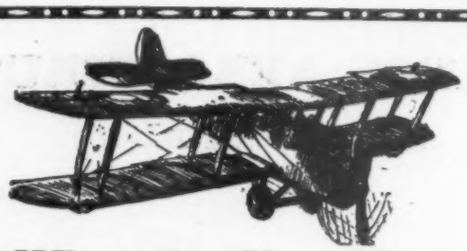

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gavel by the retiring secretary, Julius R. Finn. Immediate efforts will be made to increase the club membership from 67 to at least 200. Formal opening of the club's flying field on the Union Levee (near the municipal airport) was to occur June 17, as AVIATION goes to press. An air circus and air races were on the program.

Wilmington, Del.

Henry B. du Pont, treasurer of the E. I. du Pont de Nemours Co., has purchased one of the new Pitcairn Sport Mailwings equipped with a Wright Whirlwind engine. Mr. du Pont flew the plane here from Pitcairn Field, at Willow Grove, Penna., just north of Philadelphia, in one hour.

The new craft is a modification of the Pitcairn Mailwing, now being used in the New York-Philadelphia-Atlanta air mail service. It is one of the fastest commercial planes in the country, having a high speed of approximately 130 m.p.h.

Mr. du Pont's plane has been built to carry more than 100 gal. of gasoline. It is so constructed that only a small compartment is left for baggage, the gasoline tank taking up most of the room in the plane.

Charles Townsend Ludington, president of the Ludington Philadelphia Flying Service, was an interested visitor here recently. He inspected Du Pont Field, Henry du Pont's private airport, and visited the site of the new Bellanca factory near here.

Manitowoc, Wis.

The common council of Manitowoc has authorized the purchase of a 100 acre tract of land for a municipal airport and at the same time took an option of an additional 40 acres for 18 months to permit extension of the field, if desired. The terms of the purchase of the 100 acre field are $265 per acre with a cash payment of $1,000 at time of sale and the balance to be paid within 10 yr. at four and a half per cent. interest.

The approval of the airport project assures the establishment of an airplane factory in Manitowoc, planned by the Invincible Metal Furniture Co. Another result of the movement will be the establishment of a school of aviation to be directed by W. C. Williams, who will doubtless act as manager of the airport and conduct the school at the field.

Kilbourn, Wis.

Wisconsin's Dells has a landing field now, comprising 60 acres and designated on government maps as Beacon No. 19. The port is on the Milwaukee-Minneapolis route and is operated by Clinton Berry. Berry built the field because of numerous inquiries regarding airplane landing facilities in that vicinity. The Dells are famous for their beauty and hundreds of visitors from Chicago, St. Louis, and other cities visit this spot each summer.

San Diego, Calif.

H. D. Ballard, San Antonio resident and property owner in 17 states and four Canadian provinces, took delivery of Ryan Brougham No. 77 April 14 and since that time has flown 20,000 mi., visiting 32 states and Canada. Ballard's plane has more instruments and equipment than the new Brougham recently delivered to Colonel Lindbergh. On May 26 Ballard flew from San Antonio, Tex., to San Diego, a distance of 1350 mi. in 11 hr. and 50 min. making two stops.

A tour of California followed, after which the plane was returned to San Diego for installation of larger gas tanks enabling the completion of longer flights with less stops.

Medford, Ore.

The chamber of commerce has selected a site for a permanent airport in close proximity to the city and will lay plans immediately for the construction of the field. A bond issue will be submitted to the people to finance the project. Aeronautics authorities have favored the site.

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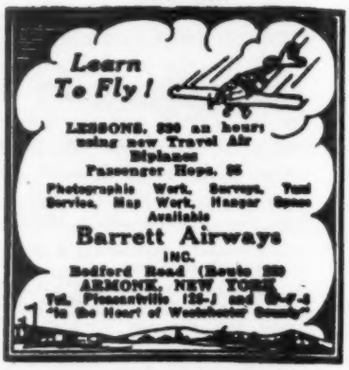
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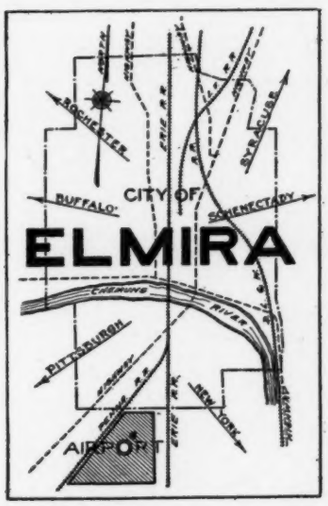

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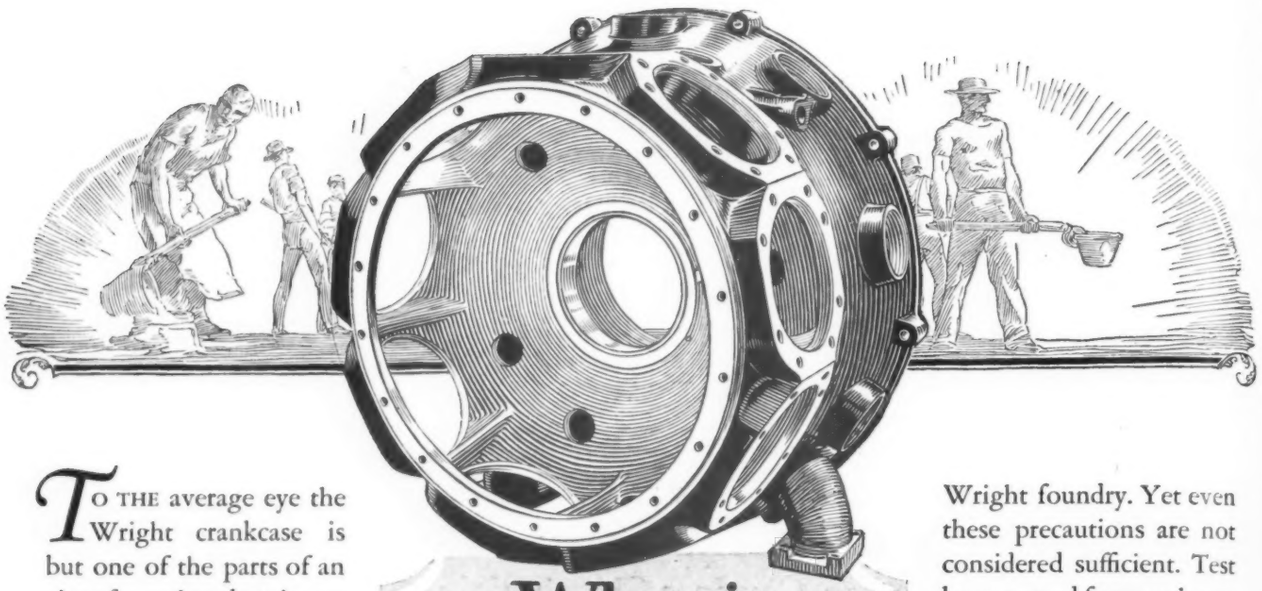

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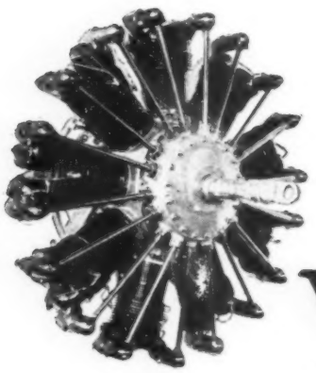

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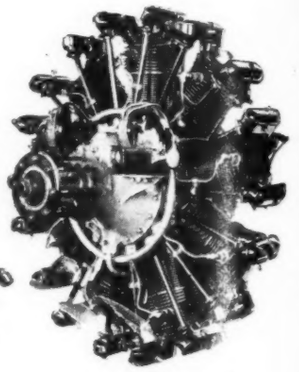

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